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REPORT OF THE CHIEF OF THE PLANT QUARANTINE AND CONTROL ADMINISTRATION

UNITED STATES DEPARTMENT OF AGRICULTURE,
PLANT QUARANTINE AND CONTROL ADMINISTRATION,
Washington, D. C., August 31, 1929.

SIR: I submit herewith a report of the work of the Plant Quarantine and Control Administration for the fiscal year ended June 30, 1929.

Respectfully,

C. L. MARLATT, *Chief.*

Hon. ARTHUR M. HYDE,
Secretary of Agriculture.

INTRODUCTION

The reorganization of last year centralized the regulatory and law enforcement activities of the department relating to plant pests under the newly organized Plant Quarantine and Control Administration. This new organization took over the work which had theretofore been carried by the Federal Horticultural Board and, in cooperation with the latter, by the Bureau of Entomology and the Bureau of Plant Industry. This included the enforcement of all quarantines issued under the authority of the plant quarantine act of 1912 and the related Mexican border act; the insect pest act of 1905; in cooperation with the Post Office Department, the terminal inspection act of 1915, and the act of 1926 authorizing inspection and certification of exports to meet the sanitary requirements of foreign countries. Included in these transfers, also, was the administration and direction of important control and eradication projects with respect to certain recently introduced pests such as the gipsy moth, European corn borer, Japanese beetle, etc.

The first year's work of the Plant Quarantine and Control Administration has fully demonstrated the advan-

tages resulting from the unification of direction of such quarantine and closely related control work. For example, under the reorganization and the appropriation language carrying the different items as subappropriations it was possible for the Secretary of Agriculture to meet with immediate support the emergency occasioned by the outbreak of the Mediterranean fruit fly in Florida. Further advantage has arisen from the ease with which personnel and equipment can be transferred from one project to another in response to seasonal changes or sudden developments. Increased efficiency and material financial savings have also resulted from the reorganization.

Five new dangerous insect and plant disease infestations have been made the subject of Federal plant quarantines during the fiscal year. These are the Woodgate rust, a disease of unknown origin attacking hard pines in northern New York State; the phony disease of peaches, which is retarding peach production in Georgia and which has recently been demonstrated to be a communicable infection; the Asiatic beetle and the Asiatic garden beetle, which only in recent years have come into prominence as dangerous pests but which, according

to available records, were probably introduced with soil about plants prior to the passage of the plant quarantine act of 1912; and the Mediterranean fruit fly.

Necessarily the major interest will attach to the establishment of the Mediterranean fruit fly in Florida, which constitutes perhaps the most serious emergency ever faced by American horticulture. This report, therefore, gives a fairly extended and informing statement with respect to the work on this subject by the Plant Quarantine and Control Administration in cooperation with the State of Florida and with other States.

The tables included in this report have been continued from year to year and constitute a record of distinct reference value not available elsewhere. Important among these tables are records of importations of restricted plants and plant products—records which give details as to the different kinds of fruits or vegetables or other plant products, and as to the countries of origin and ports of entry. Other tables give summaries in relation to the enforcement of important plant pest quarantines.

As indicated in former reports, the quarterly Service and Regulatory Announcements, published by the Administration, constitute a permanent record of new quarantines and of revisions and modifications of those already in force. The final number of these announcements for each year contains a complete annotated list of the current quarantines, domestic and foreign, as well as all other restrictive orders. In connection with these announcements, there is also published at the end of each year, under the designation "Annual Letter of Information," a list of pests collected from imported plants and plant products during the previous year. This list is accompanied by explanatory notes, and with each pest interception, there is given the host plant or article, country of origin, and the American port of interception.

DOMESTIC PLANT QUARANTINES

THE MEDITERRANEAN FRUIT FLY

CONTROLS IMMEDIATELY STARTED

The Mediterranean fruit fly was found to be rather widely established in Florida early in April of this year. The seriousness of this situation was at once recognized generally throughout the United States, as was also the

fact that every effort should be made to eradicate this pest. An emergency fund of \$50,000 was immediately made available by Florida, and State forces were mobilized in efforts looking to eradication. The large and well-organized plant-quarantine personnel of the State was thrown into this work, as were extension-service workers, technical leaders from the State experiment station, and the hundreds of citizens offering voluntary aid. The Federal Government, upon the recommendation of the Secretary of Agriculture, approved by the President and Congress, made \$4,250,000 immediately available for the control and eradication work, which had already been started by the Plant Quarantine and Control Administration of the Department of Agriculture, in cooperation with Florida, on a transfer of \$40,000 from the administration's funds and personnel from other work of the administration.

Steps were at once taken (1) to determine the extent of the spread of the pest in Florida and elsewhere, (2) to destroy all fruit in infested and surrounding orchards, and (3) to spray the trees concerned with an attractive poison bait as a substitute for the natural food thus removed. Pending quarantine action, the growers concerned were brought into agreement not to ship any fruit from the known infested groves or from the immediate vicinity of such groves except under permission of the State plant board.

QUARANTINE ACTION

Conferences between the chief of the Plant Quarantine and Control Administration and the State Plant Board of Florida held at Orlando and later at Gainesville resulted in the promulgation on April 15 of a State quarantine covering the then known area of infestation, together with a wide protective zone. The restrictions of this quarantine were applied to new areas as rapidly as these were determined. Federal quarantine action followed as soon as the required legal notices permitted. This quarantine, as promulgated April 26, covered the entire State of Florida and was immediately effective as to all areas in that State which had been found to be infested, and throughout the State on May 1.

The very considerable enlargement of known infestation in the central part of Florida during the first half of May indicated sufficient uncertainty as to the extent of the infestation to warrant additional restrictions on

fruit and vegetable movement, and on May 16 the quarantine was amended to prohibit movement of host fruits and vegetables from any part of Florida into the cotton States from North Carolina and Tennessee southward and westward including Arkansas, Oklahoma, Arizona, New Mexico, and all States south of these, and also California, Nevada, Utah, Idaho, Oregon, and Washington. This action took into account the greater risk of the fruit fly to these States, than to Northern and Northeastern States.

A number of minor amendments not here noted have been made both to the State and to the Federal quarantines to meet various needs as they have arisen.

WIDE DISTRIBUTION OF FRUIT FROM INFESTED AREAS

Prior to the discovery of the establishment of this pest at Orlando, Fla., on April 6 and the confirmation of its identification in Washington on April 10, more than three-quarters of the fruit of that district and of Florida had already moved out of the State through the normal channels of distribution, thus carrying the risk of spreading this pest widely in the United States. Much of the movement to the near-by States of Georgia and Alabama and perhaps Mississippi had been by autotruck and had consisted of fruit of lower grade, often culls, which were therefore especially open to the possibility of being infested. The more western of the States indicated had also been reached by fruit in bulk rail shipments as well as by fruit crated and shipped in refrigerator cars. Much of this fruit had been consumed, but a considerable portion of it, together with fruit shipped from points more recently determined as infested, was still held in local markets or in storage in the States of destination.

COTTON BELT STATES MOBILIZED

The likelihood of carriage of infested fruit into the Cotton Belt States was obvious, and even prior to the taking of Federal quarantine action the nature of this risk was brought to the attention of the appropriate officials of these States in communications of April 23, in which such officials were urged to have inspections made of all Florida fruit in markets or storage so that any infested shipments might be destroyed. Later on, as the widespread character of the infestation in Florida was

determined, these States, on my suggestion, were notified of this risk by the Florida State Plant Commissioner, Wilmon Newell, and on the same date (May 10) the seriousness of this situation was confirmed by a telegram from the Plant Quarantine and Control Administration again urging inspection and destruction of infested fruit, and a clean-up of containers and locations where such fruit had been kept. A call was issued at this time for a conference at Atlanta of quarantine officials in the cotton States from Texas eastward. At this conference, held on May 15, plans were made for Federal cooperation in clean-up and control work in these States. A total of approximately \$200,000 was contributed for this purpose from the special fruit-fly appropriation.

In many of the cotton States as much work of this nature had already been started as the available funds and personnel permitted. It was appreciated, however, that the work would have to be pushed to a rapid completion or the larvæ in the fruit would emerge and find soil or other safe situations in which to pupate. This necessity led to the request at Atlanta that the State extension services of all the States from Texas and Oklahoma eastward should be brought into this effort to locate and inspect Florida fruit, particularly grapefruit, in view of the impossibility of securing promptly a sufficient number of persons with the general training necessary for this work. Such cooperation was approved by the director of extension work of the Department of Agriculture, and notification to that effect was transmitted to the appropriate State and district leaders. At the same time even more intimate and widespread cooperation was secured by enlisting the services of home demonstration agents of the extension service.

This work resulted in the discovery of 14 shipments of infested fruit—a good deal of it in carload lots—distributed to 10 localities in the following States: Arkansas, Georgia, Louisiana, North Carolina, and Texas. One of the infestations in North Carolina, that at Raleigh, was based on the discovery of adult flies which had emerged in a small grocery store from infested Florida fruit. Intensive clean-up operations were conducted at this point by the State officials with Federal cooperation. Additional instances of infested fruit were reported from New York (2) and Ohio (1).

Much of the fruit which had moved into the Southern States during the winter and spring of 1928-29 had been consumed or disposed of prior to this survey, but there remained undoubtedly a large risk that the fly might later appear in these States in local orchards or gardens. The cooperative inspection work under Federal and State aid was therefore continued throughout the summer, and lasted through the peach season in Georgia and Alabama and generally through the fruit season in the other States. Up to the time of the preparation of this report no appearance of fruit fly had been determined anywhere outside of the central area of Florida—a situation which greatly favors success in the eradication effort.

METHOD OF ENTRY

The method of entry of this pest into the United States is unknown. It has wide distribution throughout the world, and the effort to prevent its entry into the United States has been continuous since the passage of the plant quarantine act of 1912, both through quarantines prohibiting entry of known host fruits and vegetables from countries which have been reached by the fly, and by inspection and quarantine enforcement at the ports of the United States. Such inspection has resulted in many interceptions of infested fruit, and the possibility of the entry of the fruit fly by such means has thus been clearly shown. The forces available for such port inspection, however, have been very inadequate, although it has been possible to increase the service from year to year. That entry must have been gained through the bringing into this country by some person, either in ignorance or maliciously, of infested fruits or vegetables seems obvious.

STATUS OF INFESTATION

In the early stages of the work it was determined that the fly was thoroughly established in several orchards within the town limits of Orlando, and at a few outlying points not more than 6 miles north and south. The later determinations of spread have confirmed the idea that Orlando was the starting point of the invasion, particularly as no infestations of a like intensity have been found elsewhere.

The status of the infestation throughout the area as now determined, as a result of the scouting of the entire State during the past four

months, has confirmed the original idea that this pest is of recent introduction, and that its introduction occurred perhaps sometime during the spring or summer of 1928. In other words, the extent of spread can easily be accounted for by the movement of citrus during the last season—fall, winter, and spring. The intensity of infestation in a few orchards in Orlando is easily accounted for by the high rate of multiplication of the insect—a rate which if only one-third or one-fourth the possible rate of increase, in the presence of abundant fruit as at Orlando, would mean the production of 10,000,000,000 insects by the fifth generation, and this number of generations would require a summer period of less than four months.

The fruit fly has now (August, 1929) been found in more than 980 localities in 20 counties within the central and northern part of the peninsular portion of Florida. The protective area surrounding these points of infestation which has been included in the quarantined area, involves altogether upward of 8,100,000 land acres. Approximately 67 per cent of the bearing citrus trees of Florida are included in this area and, on the basis of a 3-year average, 76 per cent of the citrus fruit moved from that State.

Although considerable scouting has been done in other parts of Florida and, as elsewhere indicated, in the States within the Cotton Belt, no field infestation of the fruit fly has been found outside of the area mentioned above. While it is impossible, at this time, to state with assurance that the infested area has been completely delimited, the fact that no infestations have recently been found outside of the general area as now determined is most encouraging.

HOST FRUITS AND VEGETABLES

The fruit fly can breed in practically all fruits, the only important exceptions so far determined being watermelons, pineapples, strawberries, lemons, sour limes, and nuts. The important vegetables produced in Florida which are subject to attack are peppers of all kinds, tomatoes, eggplants, and Lima and broad beans. The fruits, except as indicated, and the listed vegetables are those now subject to restriction as to movement. In Florida the fly has demonstrated a special liking for grapefruit and sour orange, among the citrus fruits, although being able to propagate in all citrus fruits other than in the lemon

and sour lime. Other freely attacked fruits commonly produced in Florida are the guava, fig, Surinam cherry, mango, avocado, peach, and pear.

ERADICATION MEASURES

The program or means of eradication developed naturally in the early days of the work. It included (1) intensive inspections which were ultimately extended throughout Florida and, as a follow-up of movement of Florida products, throughout the Cotton Belt States; (2) the clean-up in Florida of infested properties as rapidly as found; (3) the spraying of trees on such infested properties and adjacent properties with sweetened poison bait to destroy adult flies, (4) for the purpose of maintaining a summer host fruit and host vegetable free period, the destruction of all summer-ripening fruit and the prohibition of summer-ripening vegetables in both infested and surrounding protective zones, and (5) in the infested zones, the removal of all citrus and other host fruits or host vegetables (throughout the year) prior to their reaching a stage of maturity susceptible to the fly, and, as to host vegetables, the prohibition of planting such vegetables "until the State plant board, with the approval of the United States Department of Agriculture, shall determine that all infestation in such zone has been eliminated and that the restrictions of this paragraph shall no longer remain in force with respect thereto." The enforcement of Federal and State quarantines for the prevention of spread of the fruit fly has supplemented these eradication measures by requirement of orchard and packing-house controls, control of transportation in intrastate and interstate commerce, control of motor-vehicle and other road movement and other features of sanitation and protection enforced under State authority within the infested and protective areas.

Destruction of fruit.—Prior to August 1, more than 580,000 boxes of citrus fruit, 3,400 bushels of vegetables, and 7,100 bushels of noncitrus fruits were destroyed. Not all of these host fruits and vegetables were actually infested, but were included in the order because produced in or within 1 mile of the infested properties. More than three-quarters of the citrus fruit had been marketed before the fly was discovered in Florida, and a great deal of the remaining marketable fruit was later shipped out of the State, namely, all

fruit shipped from regions prior to the determination of presence of the fly. A large portion of the citrus fruit destroyed represents culls and drops which would have had no market value. A considerable number of owners, however, who had not marketed their fruit, lost their entire crop. No reimbursement has been requested for such destruction of fruit of the crop of 1928-29, and no reimbursement for such fruit is now contemplated.

Spraying.—Following the destruction of the infested fruit, the next step was to eliminate the flies remaining in the district to prevent their migrating elsewhere. To accomplish this, the infested groves and others within 1 mile of any point of infestation, were sprayed with a sweetened poison bait, and these sprayings were repeated at frequent intervals—if possible, every week, and at the beginning in the heavily infested areas even oftener. Space does not permit a description of the remarkable efficiency of such spraying which resulted in the almost complete elimination of flies in infested groves and trees by the second or third day. Neither is it possible to do more than indicate the tremendous volume of the work of fruit destruction and spraying which, at the height of the season, required the services of upward of 5,000 men, of whom 300 or more were directors of work and the rest laborers, and of all available trucks, spraying machinery, etc., which could be secured by loan or purchase, and the establishment of a depot of machines and supplies, much as in war times.

Destruction of summer hosts.—It was agreed by State and Federal authorities and others interested that the program which had been adopted in the case of the Mexican fruit-fly invasion in the lower Rio Grande Valley was essential to eradication of the Mediterranean fruit fly in Florida, namely, the establishment of a summer starvation period within the infested and protective zones during which there would be a complete elimination of all host fruits and vegetables in a stage of growth attractive to the fly, and, in lieu of such source of normal food, to supply the flies with an attractive substitute in the form of a sweetened poison bait to be sprayed on trees in orchards and elsewhere at frequent intervals. The effectiveness of this method has been fully demonstrated in the work so far, and the hope of eradication is largely centered on its intensification and continuance. It involves, however, cooperation on the part of every citizen of the State, and

the acceptance by such citizens of very material sacrifices inasmuch as it will mean, if success is to be achieved, the elimination—grubbing up or cutting down—of the trees or shrubs ripening fruit during the starvation period, as well as the prohibition of the growth of host vegetables during that period. This need of the destruction of plants comes from the impracticability which has been fully demonstrated of the daily or weekly removal of ripening fruits and vegetables from such areas. This giving up during the period necessary to eradicate the fly of cherished yard or garden plants and commercial or other plantings of the type indicated, in the interest of the major citrus industry, is recognized as a hard requirement of the citizens of the State, but one which seems to be absolutely necessary if the fruit fly is to be eliminated.

REVISION OF ERADICATION PROGRAM

The rapid additions to the infested areas as determined from week to week resulted in greatly expanding the work of clean-up of the orchards concerned and of application of poison bait to such orchards, and also of elimination of summer host fruits. To meet this situation the help of growers and others was enlisted, but even with such assistance in cleaning and spraying groves there remained uncared for the strictly residential properties, abandoned properties, and roadsides, as well as vast areas of noncommercial lands. It became apparent early in June that to carry out the program of clean-up of orchards and control of minor host fruits throughout both the infested and protective zones, and particularly to provide for the removal of all host citrus fruits in the orchards within the infested area, would involve enormous expenditures. Estimates of such expenditures requested at that time indicated a total cost of \$12,550,000 for carrying out this program for the first quarter of the next fiscal year—July, August, and September, 1929—the period during which most of this work would have to be completed. The cost of the removal of the citrus fruit from infested zones alone was estimated at \$6,300,000, and the clean-up and removal of noncitrus fruit in the protective zone at \$6,000,000.

In addition to these items there were the necessary cost of administration, quarantine enforcement, inspection throughout Florida and other States, certification of products, and

research work. The importance of the research field may be indicated by the fact that it furnishes the basis both for the eradication program and should the eradication effort fail, for the future control of the fly.

To meet the estimated cost of these various types of work, which totaled approximately \$15,500,000 for the fiscal year 1930, there was indicated a probable balance of \$3,000,000 from the original appropriation, or a deficit of \$11,500,000.

The magnitude of the problem as thus developed, together with its nation-wide concern, led the Secretary of Agriculture to seek the advice, both as to the work above outlined and as to the possibility of eradication, of leading specialists selected from various parts of the country.

The committee thus appointed consisted of Vernon Kellogg, permanent secretary, National Research Council, Washington, D. C.; H. A. Morgan, president, University of Tennessee; T. P. Cooper, dean, College of Agriculture, director of extension work, Lexington, Ky.; Victor R. Gardener, director, State experiment station and professor of horticulture, State College, East Lansing, Mich.; T. P. Headlee, professor of entomology, Rutgers College, New Brunswick, State entomologist of New Jersey, and entomologist of State experiment station; G. A. Dean, head, department of entomology, State Agricultural College, and entomologist, State experiment station, Manhattan, Kans.; and H. J. Quayle, professor of entomology, University of California, and entomologist of Citrus Experiment Station, Riverside.

These specialists, after a field survey of the situation in Florida, submitted a report emphasizing their belief that eradication was not only practicable but an economic necessity. They further recommended the very considerable enlargement of the work now under way and the modification of regulations which in their belief would permit, under a system of sterilization, the interstate movement of citrus fruits from areas which previously had been considered infested without risk of spreading the pest. At the time of the visit of this committee to Florida, the research unit of the Bureau of Entomology, cooperating with the Plant Quarantine and Control Administration, had just completed work which indicated the practicability of such control of the larvæ and eggs in the fruit either by refrigerating to 28° F. or by heating to 110°.

The committee stated that such sterilization of whole fruit could, in their judgment, be accepted as a substitute for the destruction of the mature crop in the formerly infested areas and thus do away with the great costs (\$6,300,000) already indicated for the removal of all citrus and other fruit of the coming crop in such areas, as well as the necessity for the reimbursement from the National Treasury to the growers of such fruit, estimated at an additional \$10,000,000. This reimbursement idea had in fact already been indorsed in principle by the Secretary of Agriculture and had received the approval of the Bureau of the Budget in the customary language that the expenditures contemplated "would not be in conflict with the financial program of the President."

The report of the committee is, therefore, an indorsement of the means of eradication which had been developed by the administration except as to the substitution for the proposed destruction of fruit in zones which had, at any time, been determined as infested, of the methods of sterilization already noted.

After careful consideration, the report of these specialists was adopted, and the regulations under the fruit-fly quarantine were revised to carry out the enlarged program outlined in that report.

To carry out this program for the remainder of the present fiscal year it is estimated that in addition to the funds now available, \$26,600,000 will be needed, and steps have been taken for the presentation to Congress of an emergency item of that amount.

This estimate covers the necessary Federal expenditures in the aid of the eradication effort but does not include those phases of the work which it is possible for the citizens of Florida to perform, such as the eradication in commercial properties of minor hosts and the spraying and crop clean-up in such properties, and as to these same features so far as possible also in residential or other properties. Further, as to commercial properties, it is understood that the additional work and costs required under the eradication program which relate to the required sanitary measures and to the requirements of handling and marketing of crops are to be borne by the growers and shippers.

There are, however, certain phases of the work which can not be thus delegated, and the estimate provides that the Federal Government, in co-operation with the State, shall be re-

sponsible for (1) supervision of the spraying and clean-up done by owners, (2) the clean-up of wild and noncommercial lands, abandoned properties, etc., (3) the spraying of roadsides, town properties, and wild land, (4) necessary scouting throughout Florida and other States, (5) the certification of products, (6) the supervision of sterilization, and (7) the enforcement of quarantine regulations.

The burden of eradication of any pest of this sort must necessarily fall very heavily on the State which has the misfortune to harbor a new and serious pest of this nature. Taking into account the existing financial situation in that State, Florida has contributed and is contributing largely in personnel and funds. Its citizens must necessarily absorb the additional production and marketing costs necessitated by the requirements of orchard sanitation, limitations on the season for harvesting and sale of the crop, and limitations on distribution areas—costs and losses which together will pretty well divide, between the State and its citizens on the one side and the Federal Government on the other, the anticipated costs of eradication.

To put this enlarged program into immediate operation, so far as available funds permitted, \$2,175,000 of the unexpended balance of the funds appropriated for the fruit fly was reallocated by the Secretary, August 26, and made available for use in the first quarter of the fiscal year 1930. This reallocation left for the last three-quarters of the year an amount sufficient only to carry on those phases of work incident to the closing out of accounts, the protection of Government property and leases, and other similar items which must be provided for. This action seemed to be fully justified by the necessity of increasing the work to the utmost to maintain the eradication feature of the program until the full enlargement contemplated in the plan was provided for. The reallocation will make it possible during the remainder of the first quarter to about double the inspection, clean-up, spraying, and other strictly eradication work, and will also provide for some expansion of the scouting, inspection, and investigational work as well as maintaining the enforcement of the quarantine. It means, however, that unless additional funds are provided the fruit-fly eradication and quarantine work must be largely suspended by October.

The great expenditures which are clearly indicated as necessary to effect

the eradication of the Mediterranean fruit fly present a new outlook in economic or applied entomology. It goes without saying that such expenditures can be justified only under the showing of a reasonable possibility of success. On the other hand, with the assurance of such possibility as confirmed by the committee above referred to and inasmuch as the opportunity is immediate and not continuing, there would seem to be full justification for the expenditures now under consideration. Such costs of eradication must be measured against future and continuing losses to fruit and vegetable crops which may well amount annually to many times such costs.

Recent reports on the clean-up and spraying work being carried out in Florida give great encouragement that the fruit fly can be eradicated. It has already been noted that the inspections throughout the Cotton Belt States have not resulted in the finding of any instance of local infestation of the pest. A similar inspection has been carried out in California to make sure that an invasion of this pest was not building up in that State—also with negative results. In Florida during the last few weeks there has been a rapid diminution in fly abundance and fruit infestation, and there have been few new records of the findings of infested fruit or flies. This does not mean that success is in sight or that it has been almost attained; but it does indicate that, if these means of control can be greatly increased and intensified, eradication is possible. The findings referred to are based on the reports of inspection leaders who are in each county directing labor forces which are collecting and destroying the fruit. Such inspectors therefore have ample opportunity promptly to discover new points of infestation. The notable reduction in fly numbers is also indicated by the negative results during the last six weeks from some 6,000 traps with baits attractive to the fly which have been distributed throughout the eradication area.¹

RESEARCH

Reference has been made in the foregoing pages to some of the results of the research work of the Bureau of Entomology in cooperation with Plant Quarantine and Control Admin-

istration relative to this new fruit and vegetable menace. The Bureau of Entomology, which is charged with the research work on insects of the department, has been unable to finance the great volume of work which the problems of fruit-fly eradication has called for, and this work has been supported very largely out of the special fruit-fly fund. A more complete statement of this cooperative work will be found in the report of the Chief of the Bureau of Entomology. The results so far of this research have been of immediate service (1) in developing a more effective type of poison spray to kill the adult flies in orchards; (2) in developing attractants which make possible the collection of such adult flies in orchards or elsewhere to determine the presence or spread of the pest, and (3) in developing a fumigant with which to kill adult flies in motor and railway cars, buildings, or other premises. In all of these directions great success has been met with, and new or improved means are now being applied daily in the control and eradication work.

Another very important phase of research of immediate and future value is the determination of methods of sterilizing fruit either by refrigeration or heat, referred to in the foregoing discussion—results which will make it possible to utilize all fruit other than that actually infested either in commerce or in some type of processing. Methods have also been devised for the disposal of waste and cull fruit both in bulk from the orchards and as a continuing or daily factor in connection with packing houses. Machinery for this purpose was devised, and methods for bulk disposal were worked out which were immediately put into use and have tremendously facilitated the disposal of the infested fruit of the crop of 1928-29. Of immediate importance also to the campaign of eradication have been the exact determinations made by this unit as to the host relationships of fruits and vegetables in Florida—determinations which have been translated into quarantine restrictions or into release of articles therefrom.

CLEANING OF RAILWAY CARS AND BOATS AT DESTINATION

The cleaning or disinfection, at the point of unloading, of railway cars, boats, and other vehicles or containers

¹Up to this date (Nov. 2) no findings of infested fruit have been made in Florida since Aug. 27, nor have any flies been taken in traps since Aug. 12.

which have been used in transporting restricted articles from Florida, is required under the fruit-fly regulations.

The movement of refrigerator and ventilated cars containing Florida host fruits and vegetables takes place over practically every railroad operating interstate in this country, and the restricted articles are normally consigned to almost every city and many of the larger towns of the United States. Under the customary procedure which had obtained in the past, refrigerator and ventilated cars had been billed to new loading points and cleaned more or less carefully on the tracks there before being reloaded. In view of the fact that the Florida situation was not fully known and that there was a possibility of such cars containing infested products, such a policy involved a very material danger, especially to the fruit-growing districts of the South and West. Cars loaded in Florida with grapefruit and oranges and unloaded at such points as New York, Philadelphia, Pittsburgh, and Chicago often were found later to be carrying from one to several hundred injured and discarded citrus fruits. If these were infested, the placing of such cars on loading tracks in peach-growing districts and other fruit-producing areas might easily have resulted in the escape of the Mediterranean fruit fly in such areas and eventually in the general establishment of the pest throughout the United States.

The dangers involved in this situation and the quarantine provisions which had been issued in order to meet them, were presented to the railroads in a communication from the administration dated May 8. At the same time, an enforcement organization was placed in the field with three objectives: (1) Notifying freight agents at points of destination of individual cars, by car number, which required cleaning; (2) working out with the railroads arrangements at the larger cities whereby refrigerator and ventilated cars could be cleaned at the destination terminal; and (3) inspection of empty refrigerator cars in transit to determine whether those which had previously been used in carrying Florida products had been properly cleaned before being billed to new loading points.

As the shipment of Florida host fruits and vegetables to the Southern and Western States was discontinued (PQCA-229) on May 16, the destinations involved throughout the remainder of the spring shipping season were confined to the Northern and

Central States. Practically all such north-bound movement passed through the gateways of Potomac Yards, Va., and Cincinnati, Ohio. Inspectors stationed at these points attached car-cleaning instructions to the waybills of all northbound cars carrying Florida products, and at the same time notified the inspectors at the destination freight yards that such cars were en route. Traveling inspectors with headquarters in Boston, New York, Pittsburgh, and Cincinnati-Chicago, respectively, consulted with the railroad officers and freight agents involved to make certain that facilities were available and that the cars were actually being cleaned.

Empty refrigerator cars were inspected in transit at Potomac Yards, Cincinnati, Evansville, St. Louis, and Atlanta, and for briefer periods at Buffalo, Cleveland, Toledo, and Chicago. One hundred and thirty-one cars which bore evidence that they had been used in the transportation of Florida products but had not been cleaned at the unloading point were intercepted between the middle of May and the end of the fiscal year. These were either cleaned at the point of interception or traced and cleaned later. The figure given is in addition to certain cars found dirty by railroad employees themselves and cleaned without reporting the individual numbers of the cars to the department.

Between May 16 and June 30, 4,310 carload shipments of restricted material were reported as consigned from Florida to approximately 190 cities and towns scattered throughout the area into which Florida products were allowed to move. By June 30, car-cleaning reports had been received from the railroad companies covering 4,181 cars; of the balance the railroads are known to have cleaned some about which they failed to make reports, others were overlooked and in many cases discovered later and cleaned in some other area, while still others were in the cleaning yards at the end of the month.

In addition to keeping in touch with the movement of individual cars which left Florida with restricted articles after the quarantine became effective, the administration pointed out to the railroads that the requirements were also applicable to cars which had been used for the transportation of such fruits and vegetables prior to May 1. The damage which might occur from a single infested fruit reaching a fruit-growing area was pointed out to them, and they were urged to take every

precaution to keep "empties" from carrying fruit flies. Most of the railroads and refrigerator-car lines made every attempt to carry out this recommendation, and for a period of several weeks railroad employees at the larger northern cities opened every empty refrigerator or ventilated car in their territory and cleaned all those which showed any signs of having transported Florida articles.

During June Federal inspectors made a survey of the situation in the Pacific Northwest, visiting especially the freight stations at Spokane, Yardley, Hillyard, Walla Walla, Attalia, Seattle, and Auburn, Wash., and Portland, Oreg. No definite and positive violations of the quarantine regulations were observed. It was found, however, that refrigerator cars of unknown prior use were reaching the Pacific Northwest after having been very poorly cleaned or not cleaned at all. The inspectors reported that the cars might have carried many serious pests and that it appeared in general that such cars may be responsible for a considerable amount of the pest dissemination occurring in the United States.

As a result of reports by the administration to the State inspectors of Washington and Oregon on this subject, the State departments concerned have undertaken the inspection of all of the refrigerator cars arriving in their various horticultural districts, and all dirty cars are now being cleaned under the supervision of State employees. No general Federal inspection force was therefore organized for the Pacific Northwest.

Supplemental to the Federal requirements the fumigation of all refrigerator cars from eastern points was insisted on by the officers of the States of Arizona and California, and under these requirements the largest of the refrigerator-car lines, operating in the Southwestern States, reports having fumigated 295 cars with hydrocyanic-acid gas during May, and 1,174 during June.

The conditions observed in refrigerator cars in connection with the enforcement of the car-cleaning requirements of the fruit-fly quarantine strongly indicate the desirability of a general rule on this subject applying to all interstate commerce. The danger that "empties" may be aiding in the distribution of serious insect pests throughout the United States has been strongly emphasized by many instances of such carriage of pests to new locations. The enforcement of a

general regulation that all railway cars used for transporting agricultural products shall be cleaned at the point of unloading would have the advantage of disposing of the debris therefrom in large cities where ultimate damage is least likely to occur, whereas the present practice of diverting the empty cars to new loading points before cleaning means that every opportunity is given for the establishment of infestations in districts having large horticultural interests.

GIPSY MOTH AND BROWN-TAIL MOTH

SEVERITY OF GIPSY-MOTH INFESTATION INCREASING IN NEW ENGLAND

The severity of gipsy-moth infestation based on the acreage of defoliated woodland was much greater in the summer of 1928 than it had been for many years. Apparently the acreage for the summer of 1929 will exceed that of the previous year as the pest is unusually abundant in Maine and New Hampshire. The insect has increased during the last few years in eastern Vermont and in Massachusetts west of the Connecticut River, and to a less degree in Connecticut, but in most of this territory the pest has not become abundant enough to defoliate large areas. The fact that this increase has been progressive during the last few years indicates potential damage and additional difficulty in the future in keeping the barrier zone (see p. 11) which adjoins this territory to the west, free from the insect.

These conditions were emphasized during the year by the discovery of an increasing number of infested locations in the barrier zone. In March, 1929, a deficiency item of \$50,000 was appropriated by Congress to make possible the clean-up and treatment of infestations that had been discovered earlier in the year. The elimination of such infested areas is vital if the protection of the area west of the barrier zone is to be maintained.

EXTERMINATION WORK IN NEW JERSEY

The effort to eradicate the gipsy moth in New Jersey, which has been going on now since 1920, seems to be fairly rapidly approaching a successful completion, only one infestation, namely, that in Piscataway Township, having been found during the year. Necessarily, however, intensive inspections must be maintained for some years more over a portion of the area. The area where intensive work is now

required covers considerably less than 200 square miles. This area includes the more important centers of infestation, as originally determined. Intensive scouting work was begun in the northern part of this area in December, 1928, and was completed in April, 1929. A tree-by-tree inspection was made of the entire townships of Mendham and Bernard, and the northern part of Hillsboro, together with similar inspection of substantial acreages that were contiguous in the townships of Randolph, Denville, Chester, Hanover, and Morris, but no infestation was found.

At the conclusion of this work a number of inspectors were detailed to examine territory which was under suspicion on account of having been previously infested, and early in May larvæ of the insect were found in Piscataway Township, near the Hillsboro Township line. The center of infestation was in an area used for a dump, and hatched egg clusters were present, indicating that the colony was more than one year old. The infestation and the surrounding territory was immediately treated, and as a precautionary measure an area embracing over 50 acres was thoroughly sprayed.

Surveys were also carried on by expert inspectors early in the fiscal year 1929 around all of the old colony sites in the outside area, and this was supplemented by the use of assembling cages to attract any male moths that might have developed earlier in the season. This plan of scouting had been tried experimentally for a number of years at the gipsy-moth laboratory and had been tested in the field over large areas. The results were sufficient to indicate that it was of value in checking up infestations in suspected places, although further development of the method will make it a more reliable index. Four hundred and twelve cages were used in 19 townships, and no gipsy moths were attracted. This tended to confirm the results of the field scouting as indicating that the infestations had been exterminated.

The results of the year's work will make possible a further reduction in the area requiring intensive scouting, but the exact limits can not be determined until early in the next fiscal year.

In cooperation with the State of New Jersey, this work of eradication is being carried out by the administration under a State quarantine, and to give unit control the State has turned

over its personnel and funds to the Federal administration. The object of both State and Federal appropriations has been eradication. Quarantine enforcement has had to do only with shipments of nursery stock and forest products moving from infested areas to points outside.

This is the largest extermination campaign ever attempted on a forest insect of this type, and the excellent progress made is gratifying. The volume of work required has been gradually reduced and the completion of this eradication effort is expected within the next few years.

BARRIER-ZONE PROJECT IN NEW ENGLAND AND NEW YORK

Work on the barrier-zone project during the fiscal year has been continued in cooperation with the Department of Conservation of the State of New York. The work of that department was concentrated in towns directly west of the Massachusetts State line and included the rescouting of the areas surrounding the old colonies in that region and on Long Island.

Scouting by the Federal force included an examination of the roadsides and orchards in most of the towns in the New England section of the zone and intensive scouting in Milton, Vt., and around all the old colony sites. Conditions in Vermont and southern Connecticut were more satisfactory than during the previous year, but in the Massachusetts and northern Connecticut area there was a marked increase in the number of infested locations. (Table 1.) This made it necessary to examine more of the heavily wooded areas in this region, and additional infestations were found. Similar results were secured by scouting operations of the State officials in New York. Many of the colonies were small, which indicated that they had recently become established by wind spread of small larvæ from points east of the zone, showing that the maintenance of the zone is menaced by the increasing abundance of the insect in adjoining territory to the east. As the season progressed more small infested locations were found, and in May and June a number of larvæ colonies were located, particularly in towns nearest the eastern border of the barrier zone. The woodlands in the vicinity of all of the colonies discovered during the fiscal year were sprayed.

TABLE 1.—*Gipsy-moth infested locations found in the barrier zone during the fiscal years 1928 and 1929*

State and town	1928		1929			
	Infested locations	Egg clusters found	Infested locations			Egg clusters found
			Egg	Larval ¹	Total	
Vermont:						
Colchester.....	1	63	0	0	0	0
Essex.....	1	11	0	0	0	0
Poultney.....	0	0	1	0	1	17
Massachusetts:						
North Adams.....	1	2	0	0	0	0
Lee.....	1	41	1	0	1	2
Tyringham.....	1	3	1	0	1	61
Monterey.....	1	11	0	0	0	0
Egremont.....	2	43	1	0	1	61
Sheffield.....	2	105	16	2	18	1,473
New Marlboro.....	3	49	16	2	18	1,855
Sandisfield.....	5	22	2	10	12	32
Otis.....	0	0	4	0	4	64
Connecticut:						
Salisbury.....	1	13	4	0	4	163
North Canaan.....	1	42	5	0	5	167
Canaan.....	0	0	2	4	6	81
Norfolk.....	3	52	7	3	10	135
Goshen.....	1	883	0	1	1	0
Cornwall.....	1	148	2	0	2	42
Sharon.....	2	17	0	0	0	0
Warren.....	0	0	3	0	3	72
Wallingford.....	1	3,051	1	0	1	251
Fairfield.....	0	0	1	0	1	1
New York:						
Petersburg ²	(³) 0	(³) 0	1	0	1	4
Hillsdale.....	1	0	4	0	4	997
Claverack.....	1	683	1	0	1	128
Taghkanick.....	1	110	0	0	0	0
Copake.....	0	0	4	0	4	212
Ancram.....	1	493	0	0	0	0
Gallatin.....	1	246	0	0	0	0
Northeast.....	(³) 1	(³) 2	0	0	2	71
Rosendale.....	1	18	0	0	0	0

¹ The exact number of larvæ were not recorded at the time infested locations were discovered.² All work in New York State was carried out under the immediate direction of the State conservation department.³ No scouting done.

The efficiency of the spraying machines was increased by adopting a method which was tried successfully during the previous fiscal year. The sprayer tanks were divided by a partition into two equal compartments which made it possible to fill one part with water by means of a portable pumper while the spray mixture was being used from the other. This made possible continuous spraying and increased the daily acreage that could be treated about 30 per cent.

The small auto trucks that had previously been equipped with a power take-off were used to great advantage in locations that were inaccessible to heavy equipment and where low pressures were required. During the spraying season a 1½-ton truck that had previously been equipped with a take-off of a new design was operated and gave excellent results. Pressures

up to 1,000 pounds were used, and the performance was equal to that attained by our heaviest machines. The additional advantages of light weight, ease of handling, and higher speed on the road makes this sprayer particularly adapted to meet future high-duty spraying requirements.

QUARANTINE AND INSPECTION WORK

The area under quarantine in New England is divided into 27 districts, with an inspector in charge, and additional assistants are provided when heavy shipping demands makes this necessary. During November and December, when Christmas trees are shipped, approximately 100 additional inspectors are required, and during the spring and fall nursery-shipping season, 15 to 20 additional men are required. The infested area in New

Jersey is under State quarantine, and material requiring inspection is certified by men detailed from the Federal force who are conducting exterminative work in cooperation with the State department of agriculture.

On July 1, 1928, a minor change was made in the regulations relating to quarantine No. 45, which permitted shipment of Christmas trees and greens originating in the lightly infested area

from points in the generally infested area after proper inspection. This has made the regulation more workable and is a convenience to many shippers.

Shipments requiring inspection may be divided roughly into four classes: Evergreen products, lumber and forest products, nursery stock, and stone and quarry products. Table 2 indicates the volume of these products that were inspected and certified.

TABLE 2.—Articles certified under gipsy-moth quarantine, year ended June 30, 1929

Article	Carloads	Truckloads	Bags	Barrels and boxes	Bales and bundles	Crates and cases	Pieces	Packages	Lots	Infested			Egg clusters	Larvae and pupae
										Barges	Carloads	Pieces		
Evergreen materials:														
Balsam twigs			157											
Boughs	65	55	5	5	74									
Boxwood				1	185		1 460		5					
Christmas trees	724	102			29		1 25							
Cut cedars	3													
Laurel		7	985	230	10, 149									
Mixed greens		1	23	2, 296	19			198						
Wreaths			8	260	2			10						
Total	792	165	1, 178	2, 794	10, 458		1 485	218						
Nursery stock	325	1, 432		12, 827	6, 831	4, 607		10, 397						
Forest products:														
Barrel parts	19				810				5					
Crates and cratings		1			9		332		2		2		5	
Fuel wood	219	17		12					(2)					
Logs	1, 527	2				1	46		3					
Lumber	1, 029	98				21		144	19				342	224
Piles and poles	446	29					4, 415		3		16		16	
Posts	9	9					311							
Pulp wood	2, 706													
Reels	314						5, 555			4			21	2
Shavings	124	3												
Ship knees	24						681		2					
Spool stock	173													
Ties	2, 446													
Vine and shrub cuttings				67	2	59								
Miscellaneous	3 92	15	93	20	356	21	526		18	3	3		167	
Total	3 9, 128	174	93	99	1, 177	102	11, 866		2 177	3	62	18	2 1, 019	271
Quarry products:														
Crushed rock	3, 097	30												
Curbing	275						20							
Feldspar	189		2				122							
Garnet	19													
Granite	4 7, 697	4				428	175, 584			61			5 126	7
Grout	268													
Marble	1, 953			36, 768		58, 221	9, 155							
Old iron	30										1			
Paving	4 399										35		356	8
Miscellaneous	9	10	1			15	8							46
Total	4 13, 936	44		3 36, 768		58, 664	184, 889			97			482	61

¹ Trees.

² In addition to 188 cords of fuel wood.

³ In addition to 4 barges.

⁴ In addition to 39 barges of granite and 6 barges of paving.

⁵ This includes 42 egg clusters found on carting materials which could not be assigned to any one shipment.

Owing to the increase in density of infestation in the generally infested area, extreme care was exercised in the examination of products offered for shipment, which rendered the cost of operation somewhat higher than during the previous year. The conditions also made clear the importance of examining tourists' camps so far as time would permit. During the year 116 tourist camp sites were inspected, 15 of which were found infested with the gipsy moth and were cleaned up by the owners or the town officials.

THE BROWN-TAIL MOTH

The brown-tail moth, which at the beginning vied with the gipsy moth in importance of injuries occasioned and exceeded it perhaps in the annoyance which followed its presence, due to the irritating or stinging quality of the larval hairs, has for a considerable period decreased in numbers to such an extent as to have lost much of its early importance and interest. The decrease in numbers may be explained to some extent by the clean-up of winter webs which is easily possible with this insect, but it seems to be largely due to control by natural means such as disease and parasitic enemies, many of which latter have been introduced from Europe.

During the last two years, however, this insect has been increasing in numbers in many sections in southern Maine, New Hampshire, and eastern Massachusetts, particularly where no attempt had been made to remove the winter webs or carry out spraying of trees in early summer, and considerable defoliation has resulted.

The area under quarantine on account of the brown-tail moth has not been changed and is administered in connection with the enforcement of the gipsy-moth quarantine. It may be possible later on, when funds are available to scout more intensively the area now included in this quarantine, to reduce the area to a considerable extent. Inasmuch, however, as this area is entirely within the gipsy-moth area and the restrictions are similar to those imposed for the latter insect, the quarantine is not particularly burdensome either to the citizens or as to cost of administration.

THE SATIN MOTH

The satin moth will be recalled as a specific enemy, imported from Europe, of poplar and willow trees. It is now known to occur both in New England

and in the State of Washington. In New England it is entirely included within the gipsy-moth area, and the quarantine is being enforced under the gipsy-moth administration.

During the summer of 1928 an effort was made to determine whether this pest had spread beyond the area previously known to be infested in New England. This survey, cooperated in by the States concerned, has shown that this insect has greatly extended its range. The satin-moth quarantine (No. 53) was, therefore, amended to cover the newly infested territory, which included 21 towns in Maine, 51 in New Hampshire, 8 in Vermont, 33 in Massachusetts, and 59 in Connecticut, a total of 172 towns containing approximately 5,116 square miles.

In the State of Washington the pest is still limited to the counties west of the Cascade Mountains, but the intensity of infestation is gradually increasing, and the insect is slowly spreading southward. The shipment of poplar or willow trees from the areas covered by the quarantine regulations is prohibited.

EUROPEAN CORN-BORER CONTROL

GENERAL STATUS

This report is made too early to give more than an indication of the corn-borer developments as affecting the crop of 1929, but the records so far secured indicate a more or less general increase. Whether this is a mere fluctuation such as has been experienced in past years or a decided advance remains to be determined.

In connection with the crop year 1928, practically no commercial damage was experienced other than in a small area in Rhode Island and Massachusetts. This area involved only a few townships in which, largely by reason of neglect of clean-up or other controls, the corn borer had increased to such an extent as to produce serious local crop losses. In the nearest approach to the Corn Belt, namely, in western New York, Pennsylvania, Ohio, Indiana, and Michigan, the corn-borer population averages less than 7 borers to 100 stalks. This represents an actual decrease from the 1927 average of 10 borers per 100 stalks. The decrease is clearly due to effectual clean-up operations in the more heavily infested strip bordering Lake Erie and in eastern Michigan which overbalanced the modest increase in the more sparsely infested area in these States; in much of this area

there is still less than 1 borer to 100 stalks of corn. The question which can not now be answered is how rapidly and how much the corn borer will build up throughout the western area in future years. With minor exceptions the normal spread by flight in the New England area and in the western area has been in line with that of previous years.

SINGLE AND MULTIPLE GENERATION STRAINS

An interesting minor development is the continued movement of the 1-generation strain from the original eastern New York infestation into New Hampshire and Connecticut and the extension of the previously infested areas in Vermont, Massachusetts, and eastern Pennsylvania.

Both the 1 and 2 generation strains of the European corn borer were found on Long Island in separate areas during the 1928 season. The 1-generation area is on the western end, in Kings, Queens, and Nassau Counties, while the 2-generation area is on the extreme eastern end of Long Island. In the 1-generation area the infestation was found not to extend east of Nassau County and the 2-generation area did not extend west of the Mattituck Inlet, in Southold Town, nor west of the Schinncock Canal, in Southampton Town. This leaves a strip of non-infested territory between the 1 and 2 generation areas on Long Island.

With respect to these "strains," the peculiar biological fact in the history of the corn borer will be recalled, namely, that the New England infestation is two or more brooded, whereas the infestation which was established about the same time, with the original introduction of this pest with broomcorn from Europe, in eastern and western New York and in Ontario, Canada, is a 1-generation strain, and apparently holds to that biological peculiarity with great tenacity, as shown by transfer experiments. Potentially a 1-generation strain should be very much less of a menace than a strain the generations of which are restricted only by length of the season. The spread west from the New England area, therefore, of the 2-generation strain is one which may very well increase the risk from this pest. On the other hand, the movement eastward of the 1-generation strain may, by interbreeding, counteract to some extent the tendency to multiple generations in the eastern strain of the corn borer. However, the result may

be unfavorable in that it may introduce a strain that will come in between the broods of the other and thus give three broods to contend with in New England instead of two.

The results of scouting during the 1928 season are given in Table 3.

TABLE 3.—*European corn-borer infestation record, 1928*

State	Townships found infested	Townships found not infested	Area under quarantine at end of the 1928 scouting season	
			One-generation area	Two-generation area
	Number	Number	Square miles	Square miles
Conn.-----	24	90	42.73	1,008.88
Maryland.-----		29		
Mass.-----	40	74	2,243.25	4,567.92
N. H.-----	10	48	128.00	4,659.00
New Jersey.-----	4	168	71.29	
Pa.-----	13	180	27,554.35	
Vermont.-----	102	93	4,912.90	
Maine.-----	4	22		1,680.62
Indiana.-----	54	102	10,340.00	
Ohio.-----	98	115	28,424.00	
Michigan.-----	97	127	57,980.00	
W. Va.-----	7	19	516.00	
Illinois.-----		102		
Wisconsin.-----		59		
New York.-----			49,196.00	8.00
R. I.-----				1,248.00

Of interest also is the fact that the four isolated points of infestation in Connecticut—Oxford, Milford, New Haven, and Bridgeport—discovered prior to 1928 and thoroughly cleaned up by intensification of the ordinary farm practices of removing corn remnants, plowing, etc., were not infested in 1928 so far as could be determined by careful inspection. A similar clean-up and elimination in the case of three isolated points in New Jersey—Bayerne, Jersey City, and Woodbridge—may also be recorded. On the other hand, two localities in Connecticut—Old Saybrook in Middlesex County and Old Lyme in New London County—similarly cleaned up, were reinfested in 1928 and this was true also of three townships in Vermont—Pawlet, Ludlow, and Plymouth. For similar eradication work in 1929 see page 17.

DETERMINATION OF INCREASE OR DECREASE OF INFESTATION

Fairly intensive inspections are conducted each year, in the latter part of the season, to determine the actual increases or decreases in the corn-borer infestation throughout the area, east

and west. In the interest of accuracy and elimination of any special selection, as nearly as possible representative fields as to area and cultivation are chosen, five to each township, one in the center and the other four in the approximate center of the four quarters of the township. In each of these fields 500 plants are examined, taken respectively 100 plants near the center

of the central row of the field and similarly 100 plants from each quarter of the field, all of the plants at each of these five points being taken in sequence. Fields as nearly as possible in the same general location are taken year after year, but the same field very often is not available. The results of this survey for the crop year 1928 are shown in Table 4.

TABLE 4.—*Infestation survey of European corn borer, 1928*

State	Townships examined	Fields examined	Acres examined	Plants infested	Average larvæ per infested plant	Total larvæ per 100 plants
	Number	Number	Number	Per cent	Number	Number
Connecticut.....	15	54	2,631	2.90	1.68	4.87
Maine.....	10	42	5,075	2.38	1.12	2.65
Massachusetts.....	192	857	372,615	29.74	4.61	137.22
New Hampshire.....	43	181	44,092	2.05	1.65	3.40
Rhode Island.....	34	137	51,172	44.22	5.69	251.71
Eastern New York.....	116	570	1,981,632	9.02	1.62	14.60
Western New York.....	400	1,962	6,637.26	2.88	1.83	5.26
Michigan.....	348	1,737	12,186.23	5.07	2.21	11.22
Indiana.....	61	305	3,358.70	.20	1.72	.35
Ohio.....	496	2,480	20,393.64	3.07	2.11	6.49
Pennsylvania.....	206	1,025	3,193.95	.45	1.81	.82
Total.....	1,921	9,350	48,226.997	-----	-----	-----

With respect to this table it should be noted that the high average for 100 plants for Rhode Island and Massachusetts is due to the very intensive infestation in a few townships in adjoining portions of these States, and that, eliminating these townships, the average for all of New England would be very low—not even approaching commercial loss. For the purpose of comparison, it will be recalled that commercial damage begins with about 500 larvæ per 100 plants.

DIRECT COMPARISON OF TOWNSHIPS SURVEYED IN 1927 WITH THE SAME TOWNSHIPS SURVEYED IN 1928

Data from 1,101 townships surveyed in 1927 compared with the same townships surveyed in 1928 show a reduction in the average number of borers per 100 plants in Michigan from 26.06 to 15.39. The greatest improvement in the heavily infested counties is that shown in St. Clair, where there was a reduction from 113.44 to 42.09, and in Wayne County, where there was a reduction from 91.42 to 14.35.

In Pennsylvania there was a reduction in the number of borers per 100 plants from 10.51 to 1.22. This reduction is due largely to conditions in Erie

County, there being 40.38 borers per 100 plants in 1927 as compared with 6.47 in 1928.

In Ohio there was an increase in the number of borers per 100 plants from 3.79 in 1927 to 8.23 in 1928. The most heavily infested county in Ohio in 1928 was Ottawa, where the average number of borers per 100 plants increased from 33.56 in 1927 to 76.61 in 1928. Allen Township in Ottawa County showed 187.26 borers per 100 plants in 1928, and is the most heavily infested township in the 1-generation area. In Lucas County, which was the only county in Ohio where compulsory clean-up regulations were enforced during 1928, there was an increase from 31.64 to 33.25.

ERADICATION OF OUTLYING INFESTATIONS

Thirteen European corn-borer infestations were found in Brooklyn, N. Y., during the 1928 season, and 18 European corn-borer specimens were collected. It was deemed desirable to do burning work in this section, and that was begun March 12, 1929, but because of the adverse weather conditions it was not completed until April 27. Two hundred and fifty vacant-lot weed areas and back-yard gardens, or

244 acres, were burned with 37,100 gallons of furnace oil.

But one borer was found on Staten Island during the season of 1928. Burning work in this section was started on April 1, 1929. In all 55 vacant lots and small back-yard gardens, or approximately $18\frac{1}{2}$ acres, were burned with 2,500 gallons of furnace oil. This work was completed April 8. During the period in which the work was being carried on the climatic conditions were very unfavorable, and long delays were caused by rainy weather.

Three townships and one borough were found infested in New Jersey during the season of 1928; namely, Rivervale Township, Bergen County; North Brunswick Township, Middlesex County; Madison Borough, Morris County; and White Township, Warren County. These areas were burned over with fuel oil and not placed under quarantine. In some cases the cover crop was too heavy and pick-up work was necessary. Stalks and stubble were pulled and placed in piles and disposed of by the use of hand burners. The clean-up in Madison Borough was taken care of by the owner. In the three townships named 73 acres were burned, 7,900 gallons of fuel oil being used in the work.

In addition to the townships which were found infested in Pennsylvania during the season of 1928 and which were added to the Federal quarantine, there were four townships found infested which were not added to the quarantine. These were East Allen, Lower Nazareth, Palmer, and Lower Mount Bethel in Northampton County.

To add these four townships to the regulated area would have necessitated more quarantine stations and consequently large expenditures. Therefore, through an arrangement made with the State department of agriculture, these four townships were not added to the quarantined area but were cleaned up by the State. The State appointed an inspector in each of the four townships to work in cooperation with the county agent in that county in carrying on as thorough a voluntary clean-up as possible. The State could not consider making such a clean-up compulsory.

There were 3,915 acres of corn in the Pennsylvania areas, and 86.7 per cent of the farms passed the final inspection as having completed the clean-up work satisfactorily.

CLEAN-UP WORK IN NEW ENGLAND

During January, February, March, and April, 1929, several Federal inspectors assisted the State of Massachusetts in looking up small back-yard gardens and small lots of corn within the residential sections of the eastern part of that State. Previously the State had not attempted to reach the small gardener, but had sent its notices to the farmers. During this cooperative work, some 2,000 back-yard gardens were found where clean-up work had not been properly done or no attempt had been made to do it. The owners were notified that it was necessary for them to clean up as soon as possible, and their names were submitted to the State department of agriculture. Almost 100 per cent cooperation was received from the owners of these small back-yard gardens and it was not necessary to prosecute any of them. The larger growers of corn were less careful and if the corn borer is to be brought under such control in Massachusetts that sweet corn is to be raised profitably much closer attention to clean-up work will have to be given by the producers.

The State of Rhode Island upon the passage of its compulsory law early in 1929 made an attempt to clean up in the northeastern section of the State, where the infestation of the borer was most severe last year. Some good was accomplished, but since the work was not started until April 15 the results were unsatisfactory. Connecticut also did some clean-up work in its infested area, and it is expected that compulsory clean-up regulations will be enforced in these two States this fall and winter.

QUARANTINE AMENDED TO PROTECT MAINE

The degree of infestation in the corn-borer extension into the southwestern part of Maine has been very light, largely due to active clean-up operations instituted by the growers. On the other hand, as already indicated (p. 16), the borer infestation in a fairly important green-corn-producing section of Rhode Island, with a slight extension into Massachusetts, was very heavy and corn shipped into the Boston market from this area was so badly infested that it was almost impossible to find an ear of corn without borers. Wholesale shipments of such infested

corn to Portland, Me., caused considerable alarm among Maine farmers, and it was feared that the number of borers introduced with it would counteract the results of the clean-up efforts. At the request of the Maine commissioner of agriculture, the Federal quarantine was amended on August 7, 1928, by adding the requirement that restricted articles will not be allowed to be moved into the State of Maine from any point in the regulated areas outside that State unless a certificate or permit therefor shall have been issued by the United States Department of Agriculture. To enforce this restriction five quarantine stations were maintained on the principal bridges between the States of Maine and New Hampshire. The period of operation was from August 8 to September 11, 1928. During this time 256,516 cars were stopped and 7,286 ears of corn taken. In addition to the corn, there were seized at these stations quantities of uncertified rhubarb, beans, celery, beets, gladiolus blossoms, dahlias, asters, zinnias, chrysanthemums, cosmos, and mixed flowers.

USE OF STUBBLE PULVERIZERS

To aid in the clean-up of corn stubble prior to the planting of small grain, and under special authorization and appropriation, stubble pulverizers purchased during the clean-up campaign of 1927 were loaned to farmers under a cooperative agreement. According to the original plan these machines were to be used in the 1 per cent areas of Ohio, Michigan, and Indiana and, also, if there was sufficient demand, in Pennsylvania and New York. Little wheat and oats are sown in Pennsylvania and New York, while large wheat areas are found in the northern part of Ohio. About the first week in October, information relative to the department's plan was given to the farmers through agricultural organizations and the press. As most of the winter wheat had already been sown and many farmers did not care to operate equipment in fields on account of the ground being loose and unsettled, there was less demand for the equipment than had been anticipated.

Sixty-one machines were asked for, and these were used on 211 farms in Ohio and Michigan, a total of 4,338 acres being cared for. The average cost to the farmers was 60 cents per acre.

ROAD-STATION MAINTENANCE

In the western area, the States west of Pennsylvania, the quarantine-line work started about July 20 and was discontinued September 30, 1928. In the central area, or the 1-generation area east of Ohio, the stations were started July 22 and were discontinued October 30.

The stopping and searching of cars for corn as they left the quarantined area is believed to have been done in a more efficient and thorough manner than ever before.

The number of cars refusing to stop during the 1928 season might well be considered negligible. For instance, in Ohio, Michigan, and Indiana, only 995 cars refused to stop as compared with more than 4,000,000 which stopped and were inspected.

Of the corn seized at the quarantine lines, but a small portion could be examined. Out of 612 shipments 632 borers were obtained. Some of the corn taken at the lines was destined to States far outside of the quarantined area, such as Nebraska, Missouri, Texas, and California. Two borers were found in one shipment consigned to Reynolds, Nebr., and one borer was found in a shipment intended for St. Louis, Mo. Three infested ears were being taken to Rochester, Minn.

GRAIN INSPECTION IN THE CENTRAL AND WESTERN AREAS

On March 1, 1929, the Federal regulations were amended discontinuing the requirement of certification of packages of shelled corn weighing 2 pounds or less. This eliminated a great deal of trouble and the department was able to carry on the work with a smaller force than previously.

The practice of issuing permits to grain dealers is still being followed. These permits are granted to dealers who sign and file with the Department of Agriculture an agreement not to move or allow to be moved to points outside the quarantined area under certificates issued to them, any corn until it has been shelled and cleaned to comply with Federal regulations. All elevators making regular shipments of shelled corn are using the permit system, and inspectors issue permits and certificates sufficient to carry them for 30 days. Periodic inspections are made of the corn and equipment at the elevators. There are a number of grain elevators that do

not ship out of the quarantined area regularly and in these cases inspection and certification of individual shipments is necessary.

MARKET INSPECTIONS IN NEW ENGLAND

The quarantine in New England on vegetables is effective only from June 1 to December 31 of each year. On other products, such as corn and flowers, it is effective the entire year. Inspections of such materials are made at Boston and Worcester, Mass., Providence, R. I., and Portland, Me. During the calendar year 1928 the following products were permitted or certified:

Certified-----	3,932,992 cut flowers and plants.
Do-----	34,112 bushels of vegetables.
Permitted-----	65,511 bushels of vegetables.
Do-----	25,820 shipments of oats and rye straw.
Do-----	7,621,391 pounds of seed, commercial, popcorn, and broomcorn.
Certified-----	14,730 pounds of seed, commercial, popcorn, and broomcorn.
Permitted-----	44,052 pounds shelled corn shipped under the permit system.
Do-----	48 bales of corn husks and 1 bunch Sudan grass.

The articles certified originated in the regulated area and those permitted originated outside and were reshipped from points within. In these inspections 4,109 specimens of the European corn borer were collected. There seems to have been a rather heavier infestation in certain vegetables and in certain ornamentals than usual. For example, as many as 365 borers were taken from 1 bushel of Lima beans, and gladiolus flowers were frequently infested.

JAPANESE BEETLE

SPREAD AND QUARANTINE ADJUSTMENT

The area now under regulation on account of the Japanese beetle involves portions of seven States and the District of Columbia; namely, in addition to the latter, all of New Jersey, eastern Pennsylvania, northern Delaware, and small portions of Connecticut, New York, Maryland, and Virginia. This area now reaches a total of 21,353 square miles as compared with 19,827 square miles of the previous season—an increase of 8 per cent. The most distant point of spread is approximately 192 miles by air line from the original center in western New Jersey.

The main area of this spread has been very largely occasioned by the normal annual flight outward of the beetles of some 10 to 15 miles during the period of 18 years since the original introduction of the insect—making allowance for the much slower spread in the years immediately following its introduction. A type of aided spread to isolated points remote from the general area is discussed below.

During the summer of 1928, Japanese beetles were found at the following new localities all more or less isolated from previously known infestations: Hagerstown, Frederick, and Delmar, Md.; Lewistown and Sayre, Pa.; Hartford and New London, Conn.; Springfield, Mass.; several points in Delaware; and in and near Alexandria, Va. In addition, the isolated infestations formerly known and made the subject of partial eradication experiments in northern Delaware and at Baltimore, Cambridge, Perryville, and Chesapeake City, Md., and Washington, D. C., were found to be persisting. No Japanese beetles, however, were discovered at York or Gettysburg, Pa., or Ridgely, Md., where eradication work had also been carried on.

In consideration of this situation a public hearing was held September 24, 1928, "to consider the advisability of extending the Japanese-beetle quarantine to the States of Massachusetts and Virginia." At this hearing also, and in a series of subsequent conferences, the subject of what disposition should be made of such outlying points as those referred to above was given consideration.

The quarantine as later issued included the area covered by the normal or contiguous spread of the insect, namely, for Pennsylvania the township of Bye in Perry County; for Connecticut the city of New Haven and certain adjacent townships; for Delaware all of the State north of Sussex County; and for Maryland the northeast corner of the State, including most of Cecil County. With respect to the isolated points the Secretary approved the policy of treating them as separate control units rather than including them by a broad extension of the quarantine lines in the general quarantined area. This action was conditioned upon cooperation by the States concerned acceptable to the department, and is in accord with policies which hitherto have been followed in connection with other plant quarantines. In the case of the Japanese beetle such State cooperation involves

(1) nursery control under State quarantine, but with Federal supervision, making such control equivalent to what it would be under a Federal quarantine; (2) enforcement of clean-up operations to reduce or, if possible at certain points, to eradicate the pest—these operations to include soil treatment of areas known or believed to be infested with larvæ and the collection of beetles during the next summer by use of traps or by hand.

The outlying points of infestation concerned are as follows: Hagerstown, Frederick, Cambridge, and Delmar, Md.—the latter town lying in both Maryland and Delaware; Lewistown and Sayre, Pa.; Hartford and New London, Conn.; Springfield, Mass., and Washington, D. C., including Arlington County, Va., namely, the portion of Virginia which was originally incorporated in the District of Columbia.

At several of these points only one or two beetles have been found, very possibly mere chance escapes from passing motor cars. Such points and the number of beetles found in each are as follows: Hagerstown, 1 beetle; Frederick, 2; and Lewistown, 1. In Cambridge, 15 beetles were found; in Sayre, 14; in New London, 11; and in Hartford, 12. At none of these towns has there been any determination of soil infestation, but the numbers of beetles would indicate that the soil may be infested.

The points where definite soil infestation has resulted include, notably, Washington, Baltimore, and Springfield, and, to a less extent, Cambridge and Delmar, but at all these points the beetles are limited to the town or immediate suburbs. At Springfield a heavy infestation developed, limited practically to two small points, in which by intensive collection, over 5,000 beetles were taken. At none of these points are any nurseries directly concerned or areas of production or distribution of farm produce. Nevertheless, any nursery establishments in proximity to the towns enumerated will be brought under the same restrictions that are now applied to nurseries in similar situations in the general Japanese-beetle area.

The proposed controls against spread from such outlying points may be even more effective than the controls in the general area under the Japanese beetle quarantine, particularly as it is proposed to collect and destroy the beetles as they emerge throughout the season. The continuance of this arrangement beyond 1929 will necessarily be conditioned upon the success of

the local control efforts and the spread, if any, into intervening territory.

Such outlying infestations must necessarily be a recurring factor in connection with all plant quarantines, and, in the case of the Japanese beetle, the plan for 1929 will give opportunity for a thorough demonstration of the possibility of control by local clean-up. On the other hand, to include these points and the intermediate territory under the general quarantine would immediately open extensive areas in the States concerned to the uncontrolled movement of nursery stock and farm products, with the probable result of establishing the beetle more or less throughout such areas. It would, at the same time, discourage any clean-up operations in such isolated points, and the result would be the building up of the beetle population at these points and greatly increasing the risk from them as centers of spread by road and rail traffic.

Under the policy which is adopted the benefit of active cooperation by the States, towns, and individuals concerned is secured, and of the enforcement of a clean-up program which will greatly reduce the numbers of the beetles and practically eliminate the very kind of spread, by road and rail traffic, which it is impossible to control with any large measure of success under quarantine.

SPREAD OF 1929

The Japanese beetle record for the season of 1929, so far as disclosed, indicates the following new outlying points: Boston, Mass.; Providence, R. I.; and Norfolk and Cape Charles, Va. The spread of the beetle to such isolated points as those mentioned seems to have had little or no connection with the movement of restricted products but is apparently due to another type of movement which it seems impracticable to attempt to control, namely, accidental carriage of beetles picked up by automobile or train movement through the Japanese beetle area during the period of great beetle abundance. There should be included in such movement also the carriage of beetles in boats moving from Philadelphia, especially during the active beetle season, when, due to what appears to be occasional migratory flight, the air over the Delaware River is filled with flying beetles. Such boat movement would seem to account for some or all of the new outlying points of infestation determined during the present year.

TRAP CONTROL

A very interesting phase of the work of the present season has been the effort greatly to reduce the increase in 1929 in the isolated points found to be infested in 1928, or possibly to eradicate the insect by the use of Japanese beetle traps distributed at such points. The research work of the Bureau of Entomology over a number of years has resulted in the determination that geraniol, a derivative of the Geranium, is a very powerful attractant for the Japanese beetle and in a large degree selective in that it does not attract other insects. The bureau experts have also devised a number of forms of Japanese beetle traps in which this attractant, now synthetically produced, can be placed and beetles collected. The advantage of this comes in making such collections as promptly as possible after beetle emergence and before they have placed their eggs in the soil for the succeeding generation.

An interesting experiment to test the efficiency of such traps was conducted during the season of 1929. Some 500 traps were placed on an estate in a heavily infested district near Roxborough, Pa. The record of collections in these traps during the period between July 11 and August 23 gives a total of 1,874½ pounds, the daily collections ranging from 197½ pounds to 20 pounds—the latter near the close of the period. This represents the collection of nearly a ton of beetles and at the determined average of 4,000 beetles to the pound represents nearly 7,500,000 beetles.

The traps and geraniol were furnished by the department. The cost of installation was \$30, of collecting the beetles \$225, and of removal and storage of the traps \$25, or a total of \$280, not counting the traps or chemical. A great many types of traps are now available at prices ranging from 50 cents or less upward, depending on the character and size of the trap.

In heavily infested areas, however, such trapping is not necessarily beneficial unless it is practiced by owners of all infested properties. Otherwise the beetles are attracted in vast numbers to the property in which the traps are placed, and it becomes a concentration point with the possibility of actual local increase of damage, although doubtless of some benefit to the district as a whole. The beetles fly toward the odor; in other words, against the wind, and while definite determination has not been made, are

supposed to come from a distance of 1 to 2 miles. In the instance cited the beetles were collected daily.

As already noted, such traps were utilized as one of the main features of the control of the beetle during the season of 1929 in the isolated points of infestation of 1928. In these instances the risk of attracting the beetles from the outside was absent and the total trap collections were so much to the good in reduction of beetles and prevention of the local multiplication and of spread. Some 18,000 such traps were purchased during the spring of 1929 and arrangements made during the latter part of May for their distribution, baiting, and tending. At the close of the fiscal year traps were in operation at the sites of last year's infestations at Alexandria, Va.; Washington, D. C.; Baltimore, Hagerstown, Frederick, Cambridge, Delmar, Chesapeake City, Elkton, Perryville, and Perry Point, Md.; Gettysburg, York, Lewistown, and Sayre, Pa.; Delmar, Del.; Springfield and Boston, Mass.; and Hartford and New London, Conn. Japanese beetles had been trapped in all these localities except Frederick, Md., and Sayre, Pa., by the middle of July, 1929. Necessarily the work of this season is experimental, and the reduction of future Japanese beetle population will be in direct proportion to the efficiency of the method.¹

NURSERY CLASSIFICATION

As a result of field scouting in nurseries, greenhouses, and premises adjacent thereto during the summer field-scouting season of 1928, and the grub-scouting season in the fall of 1928 and spring of 1929, 28 establishments in which Japanese beetles had

¹ The number of Japanese beetles collected in or in connection with traps during the season of 1929, inclusive, at the points named, was as follows: Delaware—Delmar, 1,034; District of Columbia—Washington, 3,085; Connecticut—Hartford, 882; New London, 168; Massachusetts—Boston, 179; Springfield, 1,064; Maryland—Baltimore, 7,184; Cambridge, 913; Chesapeake City, 1,584; Chestertown, 7; Delmar, 633; Elkton, 834; Hagerstown, 46; Perry Point, 28; Perryville, 825; Pennsylvania—Gettysburg, 270; Lewistown, 1; Sayre, 252; York, 10; Virginia—Alexandria, 3,940. More than half of the beetles enumerated were actually found in the traps, but at many, if not most points, where the traps were stationed, almost as many more had been attracted to the point by the geraniol but had not yet entered the traps. These were also collected and destroyed by the inspectors and were recorded in the total number for each place or area of distribution. It should be noted that the District of Columbia and Alexandria, Va., collections are part of one area of infestation, giving a total for this area of 7,025.

not previously been discovered were found to be infested.

Administrative instructions issued on February 21, 1929, modified the former classification requirements to permit the subdivision, for classification purposes, of nursery properties under single ownership or management but composed of separate premises. Under these instructions, such parcels may now be independently classified either in Class II or Class III. In addition, unit nursery properties of recent or scanty infestation which theretofore had been designated as in Class III could be subdivided and given Class II or Class III ratings, provided the subdivision containing the infestation was clearly marked by permanent boundaries approximately 500 feet beyond the infested point.

CERTIFICATION OF NURSERY AND ORNAMENTAL STOCK AND FARM PRODUCTS²

A total of 73,117,062 plants were certified for movement to points outside the regulated areas. Of these, 7,415 plants were treated with carbon disulphide, 26 with wormseed oil, and 48,558 with hot water. Similarly 15,550 boxes of cut flowers, 15,850.5 carloads of sand, soil, and earth, 465.25 carloads of peat, 1,018 carloads of compost and manure, 7,165,070 packages of fruits and vegetables, and 34,992.5 bales of hay and straw from the regulated areas were certified for shipment. The details of this work by months are published in the Service and Regulatory Announcements of the administration.

Under the regulations effective February 15, 1929, cut flowers and portions of plants without roots and incapable of propagation (such as branches and twigs of trees and shrubs, Christmas trees, holly, laurel, sphagnum moss, and dried portions of plants free from soil) are exempted from restriction, except during the period June 15 to October 15. This latter provision eliminates from the certification requirements a considerable quantity of articles which experience had proved are not subject to infestation except during the period of activity of the adult beetle.

The presence of large numbers of Japanese beetles on the wing in the market and river-front districts of Philadelphia during parts of July and

August, 1928, necessitated the curtailment of inspection and certification of farm products. Arrangements were made whereby inspection service was granted only between the hours of 8 p. m. and 10 a. m. Between these hours beetles were not in flight and inspections could be made without danger of reinfestation. This curtailed inspection service was maintained from July 18 until August 23, at which time the beetle flight had decreased to such an extent that the restoration of 24-hour inspection service was justified.

TRANSIT INSPECTION IN PHILADELPHIA AND NEW YORK CITY

Postal and express inspectors were maintained throughout the year in the offices of various common carriers at Philadelphia and New York. In Philadelphia, one transit inspector was stationed during the 12-month period at the platform of the Railway Express Agency (Inc.) at Eighteenth and Market Streets. From July, 1928, to January, 1929, inclusive, two transit inspectors covered the railway mail terminal at Twenty-fourth and Market Streets and visited other mail-distribution points throughout Philadelphia. For the balance of the fiscal year a single inspector was assigned to this postal-inspection work.

During the peak of the fall-shipping season, 11 transit inspectors were stationed at postal and express terminal points in New York City. One inspector covered the express platform at the Grand Central terminal from July to January and was later transferred for the balance of the period to the New York Central and New York, New Haven and Hartford express terminal, to which point the express facilities had been removed from the Grand Central terminal. A single inspector was assigned to the express terminal at Long Island City during the year. Starting in October, an inspector was stationed in the general post office, and from November to April was assisted by an additional inspector. Parcel-post inspection was performed by one transit inspector at the City Hall post office, from November to April, inclusive. Postal inspection at the Grand Central railway mail terminal was performed by three inspectors from November to February, and two inspectors continued during March and April. A single supervisor covered all terminal inspection points in New York City during January and February.

The number of violations intercepted at the transit inspection points is

² The following discussion of certification, transit inspection, and road patrol, covers both the Japanese beetle and the Asiatic beetle.

shown below under the heading "Quarantine Violations."

ROAD PATROL

Thirty-five road-inspection points were maintained during August, 32 of which had been established in July. Twenty-two posts continued operations during September.

On all roads on which the volume of traffic warranted, 24-hour inspection services were maintained. On roads of lesser importance men were stationed during the hours of greatest travel, or the hours were staggered so that the inspectors might be at the posts at various times and the traffic could not anticipate a period when inspectors would not be on duty.

Of the cars passing the road stations in 1928, 39,925 were found to be carrying restricted articles. In about 2 per cent of these cases the articles had not been certified, and such articles were either confiscated by the inspectors in accordance with the plant quarantine act or taken back into the regulated area by the owners.

QUARANTINE VIOLATIONS

A total of 588 shipments were intercepted during the year while en route in apparent violation of the Federal or State quarantine regulations. In the majority of cases, the return of the uncertified material to the shipper was effected. A few of the shipments were permitted to proceed, and in a number of instances the contraband material was destroyed. In every case where practicable an investigation was made by an inspector, which included an interview with the shipper and the agent of the common carrier. Of the uncertified shipments, 428 were intercepted in the mails, 106 while being transported by the Railway Express Agency, 23 aboard steamship, 19 at road-inspection points, 8 shipments sent by freight, and 4 at port-inspection points.

Letters were addressed by the administration to a number of violators warning them of the possible consequences of further violations.

Prosecutions were instituted for two Federal violations which occurred during the year. Six cases of Federal prosecutions were closed during the period, the fines imposed totaling \$256. Six violators of the Delaware State quarantine were successfully prosecuted under the State law, and fines totaling \$90 and costs collected.

THE ASIATIC BEETLES

Following the hearing of September 24, 1928, a quarantine was promulgated (March 2, 1929) on account of the so-called Asiatic beetles, applying to the States of Connecticut, New Jersey, New York, Pennsylvania, and Virginia, and the District of Columbia. The subjects of this quarantine are two species of beetles introduced from Japan with shipments of nursery stock with soil. These beetles have been designated as the Asiatic beetle (*Anomala orientalis* Waterhouse) and the Asiatic garden beetle (*Aserica castanea* Arrow). Judging from the records of plant importations, the former was probably introduced about 1900 with large importations of nursery stock made by a nursery then existing at New Haven, Conn., and the spread in the United States seems to have resulted from this source, although obviously there may have been other importations about the same period or later. The time and place of introduction of the other species is not so definitely indicated, but was doubtless by similar importation of nursery stock with soil, possibly at about the same period.

These beetles are somewhat closely related to the Japanese beetle, and in general correspond with it in larval and adult habits. Their economic importance is largely due to their capacity to injure and destroy lawns and grasslands. This is particularly true of the Asiatic beetle, and also applies to the Asiatic garden beetle. The latter, however, is in addition an active leaf feeder and attacks a large range of crop and ornamental plants. The Asiatic beetle has demonstrated a greater capacity to destroy lawns than the Japanese beetle, and possibly a greater capacity than any of our native species. According to the State entomologist of Connecticut, it has occasioned losses or costs of replacement during a short period of over \$100,000 in only a small section of New Haven. The economic importance of these pests, therefore, must be measured largely by their menace to lawns and to all areas like parks and playgrounds, where grass is kept closely cropped. Therefore, taking a country-wide view, they are quite possibly becoming one of the most important and expensive of foreign insect introductions.

These beetles, particularly the Asiatic beetle, spread by their own powers slowly, but unfortunately, both of these beetles have already reached

important nursery districts, with the attendant risk of artificial carriage and opportunity for wide movement of the grubs in soil about plants or in other movement of soil, manure, etc. Balled plants from infested nurseries have been found to contain large numbers of the grubs in the stage in which the insect passes the fall, winter, and spring. The necessity, therefore, for the enforcement, with respect to nursery stock or other carrying products, of safeguards from these beetles would seem to be obvious.

At present the Asiatic beetles cover a considerable area in northern New Jersey and southeastern New York. There are also outlying infestations respectively at Albany, N. Y.—a determination of this year—at New Haven, Conn., Harrisburg, Pa., and in the District of Columbia. The main area of known distribution is within the Japanese-beetle area, and at the specific request of the States of New Jersey, Pennsylvania, and New York, the quarantine lines have been made coterminous with the area now under regulation in these States on account of the Japanese beetle, irrespective of actual areas infested by the Asiatic beetles. This is not true, however, in Connecticut where a special quarantine to prevent spread applying to the Asiatic beetle is being enforced by the State. Such adjustment is necessarily a matter of State rather than Federal determination. Unfortunately, the action by the other States named will probably have the effect of accelerating the spread of this pest into the portions of these States not already reached.

In the areas determined as actually infested, scouting of nurseries for the presence of these insects has resulted in the finding of 108 infested establishments. For the purpose of the quarantine, such nurseries have been classified after the same plan as that adopted for several years with respect to the Japanese beetle, except that of the present three classes provided for the Japanese beetle, Class II has been omitted. The two classes retained are, however, identical with the same classes for the Japanese beetle. These are as follows: Class I—those establishments located in districts included in the regulated area but in which neither grubs in the soil nor beetles have been found; and Class III—those establishments in which either grubs in the soil or beetles occur or which are located in districts known to be generally infested. (Class II in the Japanese-beetle quarantine covers

nurseries located in districts recently or scantily infested by the beetle but in which nursery no beetles have been found and in which it has not been possible to determine any soil invasion.) The provisions of the Asiatic-beetle quarantine correspond to the similar provisions of the quarantine on account of the Japanese beetle and are being enforced by the Japanese-beetle organization.

THE PINK BOLLWORM

WESTERN AREA OF INFESTATION

The interest in the pink bollworm still centers in the western area of infestation, in which no thoroughgoing effort at eradication has ever been made, because of the proximity to Mexico and the consequent continued risk of reinfestation, and because of certain economic conditions in areas remote from the border, which have made the States concerned unwilling to authorize an intensive eradication effort such as was successfully concluded in the case of large areas of early infestation in eastern Texas and in Louisiana.

The subject of special interest is the infestation which was determined in connection with the 1927 crop in seven counties in the extension of cotton in western Texas north of the Pecos Valley. It will be recalled that this infestation was discovered during the first three months of 1928 and involved scattered points in the seven counties, and affected some 400,000 acres of cotton land. The special significance of this outbreak was that it was in direct connection with cotton-growing areas eastward. To handle this infestation, a special emergency increase to the pink-bollworm fund of \$400,000 was obtained from Congress, and intensive clean-up operations were immediately instituted throughout the area. These measures included seed sterilization at all points of concentration in the area and an intensive clean-up of all gin premises, oil mill, etc., extending to all points outside of the area to which any seed had been carried. A plan of eradication was agreed upon between the State and the Federal Government involving the declaration of a non-cotton zone throughout this area of seven counties and in certain additional areas in Texas, including Brewster County in the lower bend of the Rio Grande, and by joint resolution and later by appropriation, \$5,000,000 was made available by Congress for such purpose. Certain

verbal changes, however, which were made in the appropriation item at the last moment made this money unavailable for use in these seven counties, and the noncotton zone was established and maintained in Brewster County only.

In view of the failure of this opportunity, which, from past experience, might well have completed the eradication of the pest, it is pleasing to note that in connection with the crop of the following year, 1928, only a single infestation was found, namely, of two bolls in a field near Odessa. This favorable result must be accredited both to the intensive clean-up of the area in question made possible under the special emergency increase of \$400,000 referred to and to conditions during the winter of 1927-28, which were unfavorable to the survival of the hibernating larvæ. In fact, all of the larvæ found in the field were dead, but it is well understood that larvæ in seed in gins or in other protected places would not necessarily have been injured by these weather conditions. It is, therefore, probable that the clean-up of all such seed and its sterilization has contributed a very important part in almost eradicating the insect.

The situation as to infestation for the crop of the current year is not yet known; it is not, however, improbable that infestations will later be discovered at different points in the area. On the other hand, eradication having reached such a state of completeness as it did with the crop of the preceding year, it may be found that the insect has been completely eliminated in this area.

The enforcement of a noncotton zone in Brewster County eliminated the insect for the year 1928. This county was replanted in 1929, and it will be interesting to note how much reinfestation will result. The main idea in extending the noncotton zone to Brewster County was to eliminate the possibility of spread by flight from that region to west Texas and New Mexico. The growing of cotton on the Mexican side of the river, however, will mean the immediate reinfestation of plantings on the Texas side, and to obtain complete protection, therefore, it will be necessary to maintain a continuing embargo against cotton production.

As indicated in previous reports, it is not practicable to undertake any thorough-going eradication measures in the Rio Grande Valley from the Big Bend to El Paso until Mexico can cooperate

so that a clean-up of the cotton on both sides of the boundary can be carried out at the same time.

THE FROST INFLUENCE IN THE WESTERN AREAS

The records so far indicate that the western areas of cotton production in Texas are approaching the natural limits of spread and damage by the pink bollworm. Other than in the Big Bend district of Texas, there has been practically no commercial loss from this insect in these areas, and the fluctuation in abundance of the pest has been very considerable and in several instances nearly to the zero point—as for example, in the winter of 1927-28. Throughout this area there was a notable reduction in infestation in the crop of 1928, and in fact in a good many places apparently a complete disappearance of the insect. For example, no specimens of the pink bollworm were found in the previously determined areas of infestation in Arizona or New Mexico. It is true that these areas have also been subjected to intensive controls such as are enforced in connection with seed, gin trash, and lint throughout all infested areas, but the cold weather during the winter of 1927-28 must undoubtedly be accredited with a good deal of the reduction. Again, in 1928 in the infested field at Odessa, only two infested bolls were found. Ten insects were taken in a single boll, and of these seven were dead.

Similarly, the infestation throughout the Rio Grande Valley from Presidio to El Paso in 1928 was exceedingly light. Perhaps the heaviest infestation developed in Presidio County, increasing from June to the end of the season as follows: 0.08 per cent in June, 0.01 per cent in July, and 0.17 per cent in August. However, in September, with mature bolls present in all fields, there was a rapid increase averaging 0.33 per cent September 1-7, 4.18 per cent September 8-14, 7.18 per cent September 15-21, and 9.4 per cent September 22-30. In October the increase became even more rapid and was as follows: October 1-7, 19.36 per cent; October 8-14, 30.73 per cent; October 15-21, 43.55 per cent; and October 22-31, 57.32 per cent. The increase continued at a slower rate in November until frost. This data is given as indicating the rate of increase under favorable weather and food conditions.

In the Pecos and El Paso Valleys the decrease in infestation noted in

other western areas was also clearly evident.

In connection with this discussion, the extent to which the infestation has varied from year to year in the El Paso Valley, where full controls of seed and crop are in effect, is shown by a series of annual surveys which have been taken on the Ivey-Dale ranch, one of the most heavily infested ranches in the El Paso Valley and one which has been regularly planted to cotton. It should be noted that this valley has an altitude of 3,500 feet,

and cotton is not infrequently subjected to early frost damage. Such early frosts, catching the larvae in various stages of immaturity, seem to be the important element in reducing numbers. In other words, the mature hibernating larva, as will be shown by experiments reported later, is capable of withstanding successfully very low temperatures. For each of the past eight years 54 man-days' inspection has been carried out on this ranch. The results are shown in Table 5.

TABLE 5.—Annual fluctuations of pink bollworm infestation in El Paso Valley

Crop year	Month of scouting	Specimens collected			Crop year	Month of scouting	Specimens collected		
		Alive	Dead	Total			Alive	Dead	Total
1928	February-----	0	0	0	1923	January-----	0	0	0
1927	January-----	1	11	12	1922	December and January..	11	63	74
1926	January and February..	0	2	2	1921	December-----	3	155	158
1925	December and January..	0	252	252	1920	December-----	0	5	5
1924	January and February..	0	3	3					

QUARANTINE LINE SLIGHTLY MODIFIED IN TEXAS

The only change in the boundary lines of the regulated area during the year was the release of a small district in the northern part of Dawson County, Tex. This portion of the county lies considerably north of the infested region as determined by inspection of the 1927 crop. As the northern boundary of the county was used as a quarantine line, the town of O'Donnell, with its seven gins, was divided. This made the segregation of cotton and its products from the regulated area at this point difficult and uncertain. When it was determined by an inspection of the 1928 crop that there had apparently been no outward spread of the pest, it was believed there would be no increase in risk from releasing this portion of the county, and moving the quarantine line to the south side of the O'Donnell ginning area. This action was taken on May 16, 1929.

FIELD INSPECTION

Field-inspection work is a very necessary corollary of regulatory activities of this kind. In the first place, infestation must be discovered and delimited before adequate control or eradication measures can be applied intelligently. In the second place,

after such measures have been applied, it is necessary to determine the results. In this connection, attention may again be drawn to the continuing risk of reinfestation from Mexico. This risk so far as the movement of products from Mexico into the United States is concerned has apparently been successfully met by quarantine enforcement along the Mexican border, but an important element of risk which it has not been possible fully to safeguard against is the movement, across the border, in violation of immigration regulations, of thousands of Mexican laborers with their household effects, involving the carriage of more or less bedding and other articles stuffed with seed cotton. Very frequently such material when intercepted is found to contain living pink bollworms. A general survey of regions more or less affected by this movement is a necessity if new outbreaks of the pink bollworm are to be discovered in time to be effectively controlled and cleaned up.

A considerable force is required to cover the large areas now under regulation and also the various points under suspicion. During the year there was a total of 8,539 man-days' scouting done. Table 6 shows the distribution of this work, together with the results for the crop year 1928 and the four preceding years. Much less time has been devoted to the old eradication

areas in east Texas and Louisiana than in previous years. The intensive scouting carried on in such areas for several years following the finding of the last infestation eight years ago is deemed sufficient to warrant the conclusion that the pest has been eradicated in that region. In the lower Rio Grande Valley of Texas and adjacent Mexico, a total of 1,030 man-

days' scouting was done, with negative results. A total of 2,809 man-days' inspection has been made outside any area heretofore known to have been infested, mostly in Texas. This includes 1,557 man-days of bollie inspection. Most of the points covered were under some slight suspicion for one cause or another. The results were negative.

TABLE 6.—Summary of pink bollworm scouting showing number of man-days' scouting and number of infested fields for each of the districts scouted, crop years 1924-1928

Area and district	1924		1925		1926		1927		1928	
	Man-days	Infested fields	Man-days	Infested fields	Man-days	Infested fields	Man-days	Infested fields	Man-days	Infested fields
Eradication areas:										
Hearne, Tex.	0	0	0	0	0	0	0	0	0	0
Trinity Bay, Tex.	1,046	0	787	0	828	0	1,025	0	97	0
Ennis, Tex.	835	0	606	0	566	0	842	0	11	0
Marilee, Tex.	612	0	237	0	283	0	418	0	20	0
Cameron, La.	655	0	649	0	661	0	533	0	0	0
Shreveport, La.	826	0	606	0	568	0	781	0	0	0
Infested areas:										
Pecos Valley, N. Mex. ¹	741	0	626	16	97	0	126	2	0	0
Pecos Valley, Tex.	650	15	183	22	32	8	1	6	74	2
Mesilla Valley, N. Mex.	158	0	155	0	47	2	303	6	76	0
Mesilla Valley, Tex.	140	0	17	1	1	2	0	0	6	0
El Paso Valley, Tex.	397	1	131	14	114	4	55	2	54	0
Big Bend, Tex.	167	62	(2)	96	(2)	(3)	(2)	(3)	(2)	(3)
Big Bend, Mexico.	(1)	2	0	0	(2)	(3)	(2)	(3)	(2)	(3)
Juarez Valley, Mexico.	0	0	2	3	27	0	0	0	18	0
San Carlos, Monclova, Mexico.	40	0	37	0	36	2	0	0	14	0
Deming, N. Mex.	0	0	15	0	34	3	2	1	103	0
Duncan Valley, Ariz. and N. Mex.	0	0	0	0	71	1	9	3	156	0
Gila (Safford) Valley, Ariz.	0	0	28	0	262	4	7	3	175	0
Cochise County, Ariz.	0	0	11	0	160	10	20	4	21	0
Santa Cruz Valley, Ariz. ²	333	0	197	0	339	0	454	1	85	0
Western extension, Tex. ³	0	0	0	0	0	0	850	24	1,790	1
Suspicious areas:										
Uninfested western extension, Tex.	16	0	746	0	967	0	1,684	0	2,000	0
Lower Rio Grande, Tex.	354	0	886	0	671	0	592	0	974	0
Lower Rio Grande, Mexico	34	0	16	0	15	0	8	0	56	0
Other areas ⁴	444	0	436	0	1,198	0	926	0	2,809	0
Total	7,448	80	6,371	152	6,977	36	8,636	52	8,539	3

¹ Infestation in this valley was confined in the past to Carlsbad and vicinity and is referred to in certain previous reports as "Carlsbad" infestation.

² Research examinations.

³ Heavy infestation; exact number of fields not recorded.

⁴ Figures not available.

⁵ Includes plantings extending from Red Rock southward to Nogales.

⁶ Inspections for 1924, 1925, and 1926 included in uninfested western extension.

⁷ Covers scouting done around centers in the Cotton Belt to which seed from infested areas had been distributed in the earlier years of the campaign of eradication. These areas were thoroughly investigated for a number of years afterwards without finding any infestation, but it seemed advisable to give them an intensive resurvey before releasing them from further consideration.

CONTROL AND ERADICATION METHODS

The principal control or eradication measures which are enforced in the infested areas of west Texas and New Mexico and Arizona include (1) the destruction or safe disposal of gin trash, (2) the sterilization of seed at gins, (3) supervision of oil mills han-

dling seed produced in infested areas, (4) fumigation and compression of lint, and (5) road quarantine stations for the purpose of intercepting restricted products being carried unwittingly or otherwise out of the area.

Destruction of gin trash.—All gins are equipped with cleaning machinery which removes from seed cotton con-

siderable foreign matter. It has been discovered that in an infested area a considerable number of pink bollworms are discharged in this gin trash. During the season as many as 500 larvae have been found in the trash from a single bale in the Big Bend region of Texas. Examination of gin trash is, therefore, an important adjunct to field inspection. As illustrating the utility of gin-trash inspection, field inspection during the season of 1928 of 54 man-days on the Ivey-Dale ranch in the El Paso Valley did not reveal the presence of the insect. On the other hand, gin-trash examination in several parts of the valley showed the presence of the insect. Examination of gin trash was also the means of determining the presence of the insect in 1928 in the Pecos Valley of Texas.

In the western extension of cotton growing in Texas, and to some extent in other areas, it is customary to gather considerable cotton by processes locally called "snapping" and "sledding." By snapping is meant the gathering of bolls with the cotton, when the bolls, on account of early frost, have not opened sufficiently to enable the pickers to remove the seed cotton easily. By sledding is meant the dragging of a sled over the row, gathering as it moves, the cotton bolls together with a large amount of trash. In either case there is a great accumulation of waste at the gin. In some extreme cases there may be as much as 1,500 pounds of such material to a single bale of ginned cotton. Even in ordinary ginning, the daily accumulation of trash is large. It is important, therefore, as a control measure, that gin trash be cleaned up daily, and one of the duties of gin inspectors is to see that such trash is promptly burned, sterilized, or ground each day as it accumulates. Following a suggestion by one of our inspectors that some types of gin waste, if ground, might be useful as stock feed, such grinding and utilization has been tried out with some success, and there is good reason to believe that the better grades of such trash may be made into a useful by-product.

Seed sterilization.—The pink bollworm normally hibernates within cottonseed, and the proper treatment of seed constitutes one of the best means of control and should be credited with a large part of the success of our efforts in the infested western areas. The method consists in heating the seed to a temperature of 145° F., and all gins in regulated areas (137, including 9 in Mexico) are required to have

seed-heating machinery equipped with a thermograph, so that a continuous record will be made. During the season 236,000,000 pounds of cottonseed were thus treated. This work is supervised, and each gin is visited at least once a day by an inspector, and all the machinery is checked to see that it is functioning properly. The thermograph charts are taken up daily and graded on the basis of the percentage of time they show a temperature above the minimum requirement. This means that the time required for changing bales or the time lost in temporary breakdowns is charged against the efficiency rating of the gin. Even on this basis the rating for this season had a high average, 94 per cent. The highest theretofore obtained was 91 per cent for the season of 1927. Taking into account the time lost in changing bales, occasional stoppage on account of breakdowns, and the fact that a slightly lower temperature than the minimum requirement will kill a high percentage of pink bollworms in cottonseed, it is safe to assume that the percentage of pink bollworms killed is higher than the average efficiency rating above indicated.

Supervision of cottonseed oil mills.—Notwithstanding the disinfection required for all seed as it leaves the gin as a continuous process, there is nevertheless a certain percentage of risk that is not eliminated by such treatment. Such seed is, therefore, prohibited movement out of the regulated area except where the circumstances are such as to necessitate its being taken to oil mills outside of the area. The lack of available oil mills in the area made it necessary during 1928 to license six mills outside of the area. These are located at Colorado, Sweetwater, Abilene, Lubbock, Slaton, and Amarillo, Tex., and so far as their operations relate to cotton from infested areas, they are under supervision of Federal inspectors both as to milling of the seed and subsequent clean-up. Seed was carried to these mills in sealed cars, unloaded, segregated, and crushed during the winter or early spring, before the cotton from the fields reached a stage of susceptibility to infestation, the crushing being completed prior to May 1, 1929. Cars hauling seed to mills were always cleaned thoroughly before being released. Seed was required to be ground to a degree to destroy all pink bollworms. To prevent contamination of finished products, the seed, linters, and grabbats were segregated until

treated in accordance with the regulations. Approximately 100,000 tons of seed were thus crushed under supervision during the season.

Lint fumigation.—In the regulated area there are nine vacuum fumigation plants operated under supervision. Table 7 shows the number of bales of lint and linters fumigated and compressed during the year.

TABLE 7.—*Bales lint and linters fumigated, 1928 crop*

Location of plant	Lint	Linters	Total
Big Spring, Tex.....	63,158	4,191	67,349
Lamesa, Tex.....	31,753	343	32,096
Marfa, Tex.....	4,972	373	5,345
Fabens, Tex. (two plants)	61,565	3,317	64,882
El Paso, Tex.....	11,448	4,092	15,540
Roswell, N. Mex.....	32,535	2,235	34,770
Las Cruces, N. Mex.....	45,476	1,332	46,808
Tucson, Ariz.....	14,715	2,477	17,192
Total.....	265,622	18,360	283,982

¹ 2,016 bales of Mexican lint and 18 bales of Mexican linters included in above figures.

Road stations.—At strategic points on the highways leading out of the regulated areas, traffic-inspection stations are maintained for the purpose of intercepting cotton products likely to carry infestation. During the year such stations were maintained at Gail, Coahoma, Sterling City, Girvin, Fort Stockton, Alpine, Fort Davis, and Valentine, Tex.; Lovington, Lordsburg, Silver City, and two near Roswell, N. Mex.; and one near Tucson, Ariz. In addition, the State of Arizona maintained stations at Rice and Springerville. At Roswell, N. Mex., it is necessary to maintain two stations in order to cover the two main highways leading eastward from the Pecos Valley. The station at Lordsburg is for the double purpose of intercepting eastbound products likely to carry the *Thurberia* weevil and westbound products likely to carry the pink bollworm. The stations at Valentine, Fort Davis, and Alpine, Tex. are for the purpose of preventing exit of material from the very heavily infested Big Bend area.

During the year 303,226 vehicles were stopped at road stations and inspected. Of these, 13,198 proved to be transporting 157,731 restricted articles from quarantined and regulated areas.

It was necessary to confiscate and destroy much of this material, including 3,055 lots of seed cotton and cottonseed, 456 cotton-picking sacks, 1,312 quilts, pillows, and mattresses, and 686 lots of other materials—a total of 5,509 lots. Articles which it was possible to treat, disinfect, or clean at the inspection stations and permit to proceed included 3,461 cotton-picking sacks, 23 quilts, pillows, and mattresses, and 85 lots of other materials—a total of 3,569. Articles inspected and passed without treatment or found to be moving locally in compliance with Federal and State quarantine regulations included 145 lots of seed cotton and cottonseed, 11,896 cotton-picking sacks, 135,188 quilts, pillows, and mattresses, and 1,424 lots of other materials—a total of 148,653 lots.

EFFECT OF LOW TEMPERATURES ON PINK BOLLWORM LARVÆ

During April and May, 1929, some experiments were carried out cooperatively by the Plant Quarantine and Control Administration and the Bureau of Entomology to determine the effect of low temperatures on pink-bollworm larvæ. The purpose was to find out, if possible, what dependence might be placed upon the cold winters as an aid in the control of the pest.

The tests were performed by placing the larvæ in test tubes which were lowered in brine for the time and at the temperatures shown in Tables 8 and 9. The temperatures in the test tubes were found to be about 1 degree higher than those of the brine. Table 8 shows the results of exposing naked larvæ, and Table 9 shows the results of exposing larvæ within double seed, which is a decidedly more natural condition.

These tests indicate that naked larvæ are not injured at temperatures of 15° F. or above; that there is some mortality at 10° with four hours exposure or more, and that there is almost complete mortality at 5° or lower.

In the case of larvæ with the protection afforded by being within double seeds the results are somewhat more erratic; but there is apparently some mortality at 10° F. for four hours. It is interesting to note that a temperature of 0° for one hour does not give 100 per cent mortality.

TABLE 8.—Summary of percentage of mortality of naked *Pectinophora* larvæ after brine temperature exposures of 32°, 25°, 20°, 15°, 10°, 5°, and 0° F. at from 1 to 8 hour periods (series A)

Exposure (hours)	Percentage of mortality after brine temperature exposures of—						
	32° F.	25° F.	20° F.	15° F.	10° F.	5° F.	0° F.
1.....	33	¹ 22	20	30	20	100	100
2.....	20	20	60	30	¹ 30	100	100
3.....	60	0	¹ 20	¹ 30	¹ 20	100	100
4.....	10	40	10	¹ 10	¹ 70	100	100
5.....	55	10	40	10	89	100	100
6.....	30	¹ 20	30	¹ 10	60	100	100
7.....	¹ 33	¹ 20	40	¹ 20	70	100	100
8.....	30	40	30	¹ 20	60	100	100
Check.....	20	¹ 60	10	¹ 0	50	¹ 20	10

¹ Pupation.TABLE 9.—Summary of percentage of mortality of *Pectinophora* larvæ in infested double seed after brine temperature exposures of 15°, 10°, 5°, and 0° F. at from 1 to 8 hour periods (series B)

Exposure (hours)	Percentage of mortality after brine temperature exposure of—			
	15° F.	10° F.	5° F.	0° F.
1.....	24	3.4	51.5	92.9
2.....	11	8.1	65.2	100
3.....	14.8	20.5	95.1	100
4.....	0	¹ 53.6	100	100
5.....	² 6.7	² 65.3	100	100
6.....	14.3	¹ 68	¹ 97.1	100
7.....	18.8	¹ 76.9	100	100
8.....	12.5	¹ 73.5	100	100
Check.....	6.7	4.5	37.5	25

¹ Imperfect pupation.² ¹ larva reacts to stimulus only; considered recovered.

COOPERATION WITH MEXICO

There are some 15,000 acres of cotton grown in the Rio Grande Valley of Mexico adjacent to the Texas fields in the El Paso Valley and in the Big Bend. A good deal of this cotton belongs to American owners, and much, if not all, of it would normally be handled and find its market on the United States side. It follows that insistent demands have been made for permission to handle and utilize the local Mexican crop in this manner. Advantage of this demand has been taken to enforce, as a condition of such marketing in the United States, the adoption of all precautions which are being enforced on the United States side, both as to the sterilization of seed and clean-up of gins, and later, as

a condition of entry, the requirement of disinfection and compression of cotton. For the control of the pink bollworm in these districts the Mexican Government has promulgated regulations which are essentially similar to the regulations supplemental to Federal quarantine 52. The officials and citizens of Mexico have manifested an excellent spirit of cooperation in this regard.

THE THURBERIA WEEVIL

As has been noted in other reports, the *Thurberia* weevil is identical with the ordinary Mexican cotton boll weevil except that it has been separated from the latter for ages in certain interior valleys of Arizona, where it has maintained itself on a wild plant somewhat remotely related to cotton. With the development of cotton culture in small irrigation districts in these valleys it has found in cotton a plant much more favorable to its increase than the native *Thurberia* plant. As previously pointed out, also, its high importance to commercial cotton production in the more arid regions of the United States is the fact that in these ages it has adapted itself to such conditions in Arizona, and therefore these conditions, which inhibit the ordinary Mexican boll weevil, are, on the contrary, favorable to this native weevil cousin. The latter may, therefore, easily become a menace throughout the areas of western Texas, Arizona, and New Mexico which so far have been immune to the Mexican boll weevil.

The department is endeavoring by quarantine measures to prevent the spread of the *Thurberia* weevil from the Arizona valleys and by clean-up and control measures to keep it from occasioning important damage in those sections so far as is possible. Its erad-

MEXICAN FRUIT WORM

REDISCOVERY IN SOUTHERN TEXAS

ication would seem to be out of the question except by expenditures of enormous sums to eliminate the *Thurberia* plant in adjacent and surrounding mountain canyons.

The principal area invaded by the *Thurberia* weevil lies south of Tucson in the valley of the Santa Cruz. During the 1928 crop season there was a very considerable increase of the *Thurberia* weevil in this area. The scouting done by inspectors of the Bureau of Entomology shows that at Continental 9.3 man-days' scouting disclosed, in 1928, 423 infested bolls (306 weevils), an average of 45.5 infested bolls and 32.9 weevils per man-day, as compared to 13 infested bolls and 9.8 weevils per man-day in 1927. At Sahuarita 6.4 man-days were devoted to inspecting, and 92 infested bolls and 78 weevils were found, or an average of 14.4 infested bolls and 12.2 weevils per man-day, as compared to 2.5 infested bolls and 1.2 weevils per man-day in 1927. At Tucson, or in the Midvale area, 12.9 man-days were devoted to scouting, and 93 infested bolls and 81 weevil specimens were found, or an average of 7.2 infested bolls and 6.3 weevils per man-day, as compared to 2.3 infested bolls and 1.8 weevils per man-day of the previous year. These comparisons show a distinct weevil increase in the Santa Cruz Valley south of Tucson during the past season—heavier in the southern end of the valley. The scouting of the other *Thurberia*-weevil areas north of Tucson and in the San Simon and Wilcox sections indicated no weevil increase.

By cooperative arrangement with the Bureau of Entomology, the scouting to determine spread of this weevil is assumed by that bureau in connection with its research work on this insect, the quarantine remaining in full charge of the Plant Quarantine and Control Administration.

The measures of control for *Thurberia* weevil are the same as those enforced for the control and eradication or prevention of spread of the pink bollworm, namely, disinfection of cottonseed as a continuous process of ginning, compression and vacuum fumigation of lint, cleaning up of points of concentration, and road-station inspection. The totals given elsewhere of number of bales fumigated, gins in operation, tons of seed sterilized, and road-station interceptions in the report on pink-bollworm suppression include both pink-bollworm and *Thurberia*-weevil activities.

After the elapse of almost two years, from June, 1927, to April, 1929, during which no Mexican fruit-worm infestations were found in the Rio Grande Valley of Texas, this insect was rediscovered last spring in stored fruit after the commercial citrus crop had been harvested and for the most part shipped. The infestations were found on the premises of 10 growers and 2 packing houses in Hidalgo County. They were chiefly limited to the small quantities of stored fruit on these premises, except that in two instances larvæ were found in grapefruit on the trees where such fruit had previously been overlooked in the tree-to-tree clean-up and inspection. The first four properties discovered to be infested were grouped around Mercedes in the southeast corner of Hidalgo County, and additional properties were later found in the vicinity of Mission, which is located 20 miles farther west. Practically all fruit remaining in storage in the regulated area was given a careful inspection, but no infestation was found in fruit in other parts of the district.

It is believed that the new infestation has now been completely eliminated and that there will not be a possibility of the pest being carried over into the 1929-30 crop.

Prior to this discovery and at the urgent request of the growers, the time for harvesting the crop of 1928-29 had been extended for the season of 1929 from February 28 to March 30. This action was due to the lateness of the crop in maturing, the unusually weak demand for citrus fruits throughout most of the season, the seeming absence of an infestation during this and the preceding crop, and the practically complete elimination of alternate-host-fruit trees within the area, assuring a host-free period of approximately the same length as in the preceding year.

Extending the time thus for the fruit to remain on the trees is believed now to have been a mistake. Infested fruit from central Mexico was reaching the Mexican towns along the border, and the presence of susceptible fruits on the trees in Texas throughout the month of March apparently gave opportunity for the insect to become re-established after the pest had been eradicated two years before.

It is clearly inadvisable in the future to consider extension of the harvesting

season beyond the end of February. Growers themselves realize that the extension requested was apparently responsible for the infestations, and it is not probable that similar application will be made again, at least for years to come.

Upon determination of the infestations, all permits to pack and ship citrus fruits were canceled. Shippers were notified that all fruit held in storage within the quarantined area could be moved only to points north of the Cotton Belt.

ELIMINATION OF SECONDARY HOST TREES

A very strong effort, in 1928, was directed toward the completion of the elimination of the summer-host fruit trees in order that the citizens of the region might not be subject to the inconvenience of picking the green fruit each season. Surveys showed the presence of 37,293 such secondary host trees, mainly peaches and plums, most of them scattered in small numbers in farmyards and in private gardens located in cities and villages.

After the commercial grapefruit and orange crops had been picked in February, 1928, department inspectors devoted much time and attention to presenting to the owners the importance of the destruction of such trees. The first to respond were those who also possess citrus groves, and who were therefore vitally concerned with the success of this project. Community interest and public sentiment supported the campaign, and those who were not commercially affected rapidly followed the lead of the others. No legal pressure was employed, as official regulations require only the picking of the green fruit, but most owners realized how objectionable such continuing picking and destruction would become.

Since the inauguration of the quarantine in 1927, 4,513 premises have been cleaned of 37,216 secondary-host trees, and in addition many trees were destroyed in the summer of 1927 of which we have no record. At the present time there are 14 known premises with 77 trees left in the area. As only a small proportion of the owners of the trees destroyed had anything to gain personally, the entire undertaking has been an inspiring example of cooperation with much individual sacrifice of cherished trees and shrubs.

ORCHARDS CLEANED UP SATISFACTORILY

An important feature of the eradication program consists in the collec-

tion at frequent intervals and the prompt destruction by burying or other means of fallen fruit in the orange and grapefruit groves. This is considered so important that the fruit from orchards in which this is not done is refused certification.

Each bearing grove was inspected once during each 30-day period until the fruit was harvested. Many of the town lots required only one inspection during the shipping season. In cases where there were excessive amounts of fruit on the ground or growth of weeds in the orchard the "certificate of inspection" was withheld until the groves were put in proper shape. A total of 14,334 inspections were made of groves during the shipping season from September 15 to March 29. Of this number 540 reinspections were necessary because of dropped fruit or weed growth. At the close of the shipping season, March 29, tree-to-tree inspections were made of all bearing trees in the quarantined area. In addition, inspections were made of certain selected groves in Mexico for the presence of the infestation.

Enforcement of the regulations has caused the groves to be kept cleaner and in a much more sanitary condition than before the quarantine became effective, and this has been favorably commented upon by many individuals who visit the valley.

CITRUS CENSUS

The numbers of citrus trees growing in the area, as tabulated in July and August by the district inspectors, totaled 3,419,157. Seventy per cent of these trees were grapefruit, of which 85 per cent were late-maturing varieties. Twenty-eight per cent were oranges, of which 63 per cent were early-maturing varieties. Only 21 per cent of the trees listed had come into bearing. Sixty-two per cent of the trees listed were in Hidalgo County, 36 per cent in Cameron County, and 2 per cent in Willacy County.

PACKING PLANTS AND CANNERIES

Packing houses were inspected daily while in operation. Fruit, in the process of being packed, was inspected for signs of insect injury. An investigation was made of the origin of the fruit on hand to see that the packers were not picking fruit from unauthorized groves. An inspection was made of the premises to see that they were kept in a clean and sanitary condition

and that all fruit debris and culls were properly disposed of.

Canneries were operated at Corpus Christi, McAllen, Olmito, and Los Fresnos for the preservation of cull fruit. These were inspected regularly when canning was in progress to see that proper disposition was made of fruit waste and rejects.

Permits to pack and ship approved citrus fruits were issued to 269 firms and individuals, and a total of 907,249 tags were supplied to the permittees.

During the season, 1,745 carloads of fruit were moved from the quarantined area by rail. The minimum load was three hundred and forty-eight 80-pound boxes, as compared with a minimum of 310 for the previous season. Eighty-one thousand one hundred and seventy 80-pound boxes, or approximately 233 carloads, were moved by express, 160,029 boxes and baskets, or approximately 445 carloads, were moved from the quarantined area by truck and auto. Very little was shipped by parcel post. Thus, approximately 2,423 carloads of fruit were moved from the quarantined area during the season 1928-29.

ROAD TRAFFIC

Practically all road traffic leaving the valley is over the Edinburg-Falfurrias Highway. A station was established at Encino, Brooks County, on this highway for the inspection of vehicles leaving the quarantined area which might be carrying contraband fruit. During the period from October 8 to April 12, 31,614 vehicles were inspected. Of this number the following carried fruit:

Trucks with permitted fruit.....	2,474
Passenger cars with permitted fruit.....	5,321
Trucks with contraband fruit.....	16
Cars with contraband fruit.....	3,528

In all cases owners of contraband fruit were given the privilege of returning it to the quarantined area. One thousand two hundred and nine bushels of such fruit were confiscated from travelers who did not care to avail themselves of this opportunity. This fruit was destroyed.

The station at Encino was closed April 12 but was reopened upon the finding of the infestation and the placing of the embargo on valley fruit. Owing to the inauguration of the Texas quarantine against Florida fruit, traffic moving in both directions has been inspected since April 23, 1929. The Mission-Rio Grande City-Laredo road was also guarded at vari-

ous times throughout the season, but there was not enough traffic to justify a station. Two inspectors were placed on this road during May and June.

PUBLIC SUPPORT

On the whole the support given to the quarantine regulations by both growers and business interests of the valley has been all that could have been desired. Occasional violations by the growers have involved improper disposal of dropped fruit and by packers, the harvesting of fruit from groves before securing the required approval based on inspection.

Charges were filed in local courts against two individuals. In one case peaches had been allowed to reach a ripening condition. This case was settled, before it came to trial, by the owner's destroying the trees. In the other case an individual sold fruit from an infested grove. This case is still pending.

DATE-SCALE ERADICATION

SCALE-ERADICATION PROGRAM OUTLINED FOR THE FISCAL YEAR 1929

The reorganized scale-eradication program outlined in my last annual report has been pushed vigorously during the fiscal year just closed. Under this revised plan of operation two lines of work have been carried on simultaneously: (1) Reconnaissance surveys in the Imperial Valley of California and other date-growing areas of the Southwestern States, and (2) intensive date-scale eradication operations in the Coachella Valley of California and in the vicinity of Phoenix, Ariz.

The purpose of the reconnaissance surveys is to locate and map the points at which date palms are grown and to clean up any outbreaks discovered in the course of this work. These rapid surveys are to be followed later by intensive examinations of all palm plantings and by the eradication of all *Parlatoria* infestations discovered. In the intensive eradication areas, on the other hand, careful and repeated inspections are being made of all the palm plantings in the districts concerned in an effort to accomplish eradication at the earliest possible date.

The general or reconnaissance survey of the date-growing areas of the United States occupied the attention of a considerable force throughout

most of the fiscal year. By June, 1929, this phase of the program had been largely completed, and for the fiscal year 1930 it will be possible to devote a larger share of attention to intensive scale-extermination work.

The working out of the revised and enlarged program has already resulted in an improvement in the general situation. The number of infested palms found is decreasing from month to month, although the number of palms intensively examined becomes larger as the inspectors are being transferred from time to time from the general surveys to the work of scouting in the vicinity of infestations. An important factor in the improved conditions has been the adoption of the policy of destroying abandoned and uncared-for palm plantings—mostly seedlings of small value. Between January 1 and June 30, 1929, 16,987 palms were so destroyed, consisting mainly of slightly infested gardens without commercial value or of palms not actually found infested but located in danger zones.

The scale-eradication program is carried out in cooperation with the States of Arizona and California. The current Federal appropriation act authorizes the expenditure of Federal funds between February, 1929, and June 30, 1930, in the amount of \$86,700, of which \$70,000 is made conditional on a joint contribution for this purpose from the States of Arizona and California amounting to \$35,000. Such appropriations have been made by the States concerned, and the total Federal and State funds available for the period indicated, therefore, amount to \$121,700.

As additional amounts became available the personnel was increased from 14 in December to 32 in June, the places being filled as rapidly as suitable men could be obtained and trained.

The details of this work are given from time to time in the Service and Regulatory Announcements of the administration. A general statement of the conditions in the several date-growing areas follows.

COACHELLA VALLEY

During the year, 198,392 palm inspections were made in the Coachella Valley, and a total of 430 infested palms were found on 27 properties, 9 being new infestations. Two of the new infestations were dooryard plantings found in the town of Palm Springs, 3 were in large seedling gardens (practically all palms were de-

stroyed), and 4 were in commercial plantings. Eight of the new infestations were light, and the possibility of spread from them was negligible. One seedling garden which was overlooked in the 1928 survey was quite heavily infested, and there is considerable danger of spread from it. Of the 430 palms found to be infested, 244 were destroyed, 106 were defoliated and torched, and 80 were given other treatment. In addition 16,657 palms in the infested area were destroyed. Five properties showing scale in the fiscal year 1928 showed no scale in the fiscal year 1929. All old infestations show a reduction in the number of infested palms in 1929 as compared with the number in the previous year.

IMPERIAL VALLEY

The first survey of the Imperial Valley was completed in December. Including some 4,461 palms found later, the total number now known in this valley amounts to 33,044. In all 42,208 palm inspections were made, and 1,115 palms on 60 properties were found to be infested, 54 of the properties being new infestations. Most of the plantings found to be infested were small and of little value. Nine hundred and eighty-five infested palms were destroyed, 120 were defoliated and torched, and 9 were given other treatment. Thirty-eight palms not found to be infested but near infested palms were destroyed.

PHOENIX DISTRICT

The first survey of the Salt River Valley has been completed, 32,405 palms being located. In all 55,291 palm inspections were made. Forty-five infested palms were found on 12 properties. Eight of the infested palms were destroyed, and 37 were defoliated and torched.

YUMA DISTRICT

The survey of this district has not been completed. Over 15,000 palm inspections have been made in the previously infested area, and no scale has been found.

RIO GRANDE VALLEY

A hasty survey was made in the lower Rio Grande Valley between Laredo and Brownsville, Tex., and no infestation was noted on the 9,615 palms located and mapped.

QUARANTINE ON DOMESTIC NARCISSUS

The most important development of the year in narcissus-quarantine enforcement has been the authorization of the use of calcium cyanide as a fumigant for fly-infested bulbs.

Both the hot-water and the carbon-disulphide treatments heretofore employed have met with some objections on the part of producers, and the Bureau of Entomology has carried on investigations for several years to develop more satisfactory methods. By the summer of 1928, this work had reached a stage which seemed to justify the approval of fumigation for bulb flies with calcium cyanide, as an alternative to the employment of either hot water or carbon disulphide under vacuum. Accordingly, on July 12, such calcium-cyanide fumigation was authorized by the administration, and detailed requirements as to the nature and size of the fumigation chambers and the dosage and other conditions of fumigation were issued to the growers as circular PQCA-217. In the bulb-fly-infested regions, this method has since been adopted almost to the exclusion of other methods.

Under the provisions of the bulb-quarantine regulations certification authorizing interstate movement of narcissus bulbs without treatment is based on two inspections per year to determine freedom from pests; one carried out in the field during the blossoming period of the plants, and the other made while the bulbs are in storage after harvesting. These examinations are made by the inspection services of the various States cooperating with the Plant Quarantine and Control Administration.

In case infestation is found on the premises of a narcissus grower, the bulbs are required to be treated to eliminate the infestation. The treatment for eelworms consists of immersion in hot water maintained at a temperature of from 110° to 111.5° F. for two and one-half hours. During 1926 and 1927 the same treatment was required in case of bulb-fly infestation, with the option of substituting carbon-disulphide fumigation under vacuum. For the year 1928, the hot-water-treatment period was reduced to one hour in plantings in which bulb flies alone (that is, without eelworms) had been discovered, and later calcium-cyanid fumigation was authorized as indicated above.

The number of narcissus bulbs available in the United States has been in-

creasing yearly. During the calendar year 1928, State inspectors reported that they examined plantings containing 224,782,287 bulbs, of which 132,126,940 were Paper White and other polyanthus types grown in the South, and 92,655,347 were the hardy daffodil types common in the Northern States. A total of 166,900,393 bulbs was reported as having been certified for interstate movement, of which 65 per cent were certified as uninfested and the remaining 35 per cent were treated. The figures for the different States have been published in the Service and Regulatory Announcements of the administration. (See S. R. A.-98.)

Bulb production is strongly localized. Over 98 per cent of the Paper White and other polyanthus types are grown in the States of Florida, California, South Carolina, Texas, and Georgia, which rank in importance in the order named. The State of Washington surpasses all other States in the number of bulbs of the daffodil type, reporting a total of 42,171,315. Other States reporting more than 1,000,000 daffodil bulbs each are as follows: New York, California, Oregon, Michigan, Texas, Virginia, New Jersey, North Carolina, Rhode Island, Illinois, and Maryland, ranking in importance in the order named.

The lesser bulb fly has been reported in all the States named except North Carolina, South Carolina, and the States bordering on the Gulf of Mexico. The greater narcissus fly has been found in California, New York, Oregon, Rhode Island, and Washington. Bulb-eelworm infestations during the year were reported from Kansas, Michigan, New York, North Carolina, Ohio, Rhode Island, Washington, and the District of Columbia. The eelworm infestations on the Pacific coast, which were causing considerable loss when the bulb quarantine was first issued in 1926, have been brought under control to a very satisfactory extent, and the eelworms have been almost eliminated from those areas in which narcissus are grown for bulb propagation.

Violations of the bulb quarantine during the year were confined largely to instances in which packages of narcissus were shipped without a grower's certificate or dealer's tag. Investigation showed that in most cases the bulbs concerned had been properly inspected and certified but that through negligence or otherwise the tags had not been attached. Most of the interceptions were made by inspectors engaged in enforcing the

white pine blister rust quarantine, and the details are presented in the report of that project.

WHITE-PINE BLISTER RUST QUARANTINE ENFORCEMENT

The largest 5-leaved pine-growing areas of economic importance in the United States which have not yet been reached by the white-pine blister rust are the sugar pine stands of the Sierra Nevada Mountains, extending from southern Oregon through much of eastern California, and the extensive white pine stands of the Appalachian range south of southern Pennsylvania. Of lesser importance are the limber pine stands of the eastern border of the Rocky Mountain region, and the ornamental pine plantings of the central Mississippi Valley. The department is endeavoring to delay the introduction of the blister rust into these regions by preventing the movement of infected pine and *Ribes* nursery stock.

The work of the Plant Quarantine and Control Administration with respect to white-pine blister rust control includes, (1) preventing the interstate movement of possibly infected pine trees and currant and gooseberry plants into 5-leaved pine-growing areas which the blister rust has not yet

reached; (2) assisting States which have established blister-rust-control areas in preventing the reintroduction of *Ribes* into such areas, and (3) inspecting (in the generally infected States) pine-growing nurseries whose owners desire to raise 5-leaved pines under such sanitary conditions that they may be authorized to ship such pines to lightly infected States.

TRANSIT INSPECTION

As an important phase of the enforcement of the restrictions on the interstate movement of white pine, currant, and gooseberry, transit inspections are made during the fall and spring shipping seasons of express, parcel post, and freight at important distribution centers in various parts of the United States. The points manned during the fiscal year, the number of shipments inspected, and the number of shipments violating the various domestic quarantines which were intercepted are shown in Tables 10 and 11. The number of violations of the white-pine blister-rust quarantine constitute only about one-fourth of the total number of interceptions, violations of the Japanese beetle, European corn borer, and narcissus bulb quarantines, also being numerous.

TABLE 10.—*Shipments of nursery stock and other plants and plant products inspected in transit, July 1, 1928, to June 30, 1929*

Station	Period	Carrier			Total
		Parcel post	Express	Freight	
Chicago.....	{Fall.....	24, 971	2, 252	18	27, 241
	{Spring.....	184, 362	26, 650	1, 672	212, 684
Kansas City.....	{Fall.....	1, 078	676		1, 754
	{Spring.....	49, 615	8, 265		57, 880
Omaha and Council Bluffs.....	{Fall.....	2, 249	112		2, 361
	{Spring.....	7, 831	2, 717	439	10, 987
St. Paul.....	{Fall.....	1, 159	436		1, 595
	{Spring.....	29, 289	7, 683	70	37, 042
St. Louis ¹	Fall.....	90	23		113
New York.....	Spring.....	84, 426	797		85, 223
Denver.....	Spring.....	3, 244	1, 341	517	5, 102
Ogden.....	Spring.....	701	831	28	1, 560
Portland.....	{Fall.....	3, 515	1, 006	120	4, 641
	{Spring.....	16, 779	3, 820	120	20, 719
Spokane.....	{Fall.....	1, 435	218	50	1, 703
	{Spring.....	15, 985	2, 209	402	18, 596
Seattle.....	{Fall.....	6, 150	1, 837	1	7, 988
	{Spring.....	8, 130	1, 687	54	9, 871
Total.....		441, 009	62, 560	3, 491	507, 060

¹Few days only.

TABLE 11.—Summary of shipments of nursery stock and other articles intercepted in violation of Federal plant quarantines at transit inspection points, July 1, 1928, to June 30, 1929

Station	Q. 63		Q. 62 ¹		Q. 38		Q. 43		Q. 45		Q. 48		Q. 53		Q. 66		Q. 48 and 66		Q. 52 and 61		Total	
	C	NC	C	NC	C	NC	C	NC	C	NC	C	NC	C	NC	C	NC	C	NC	C	NC		
Chicago.....	29	43	70	36	---	---	5	47	24	3	10	2	13	---	5	1	---	9	21	---	161	157
Kansas City.....	3	7	56	2	---	---	---	1	2	---	---	2	---	1	1	---	---	1	---	1	61	17
Omaha.....	4	1	11	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	15	1
Council Bluffs.....	3	---	14	1	---	---	---	---	---	---	---	---	---	---	1	---	---	1	---	---	18	2
New York.....	3	2	1	1	---	---	---	---	3	5	2	---	---	1	1	---	51	44	---	61	53	
St Paul.....	9	16	17	8	---	---	---	---	---	---	---	1	---	1	1	---	---	---	---	---	26	26
St. Louis.....	1	---	---	---	---	---	---	---	---	---	---	1	---	---	---	---	---	---	---	---	2	---
Spokane.....	1	4	6	3	---	---	4	---	---	---	---	---	---	---	---	---	---	---	---	---	7	11
Seattle.....	---	8	1	5	---	---	---	---	---	---	---	---	---	---	3	---	---	---	---	---	1	16
Portland.....	12	7	10	6	---	---	1	---	---	---	---	---	---	---	---	---	---	---	---	22	14	
Denver.....	---	2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2	---
Ogden.....	3	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1	---	---	---	4	1
Total.....	68	91	186	62	0	10	48	26	6	17	5	15	0	11	4	0	61	67	0	1 378	300	
Grand total	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	678

¹In addition to the figures given here with respect to the narcissus-bulb quarantine (Q. 62), 12 violations were reported by State officials and others not engaged in transit inspection.

NOTE.—The figures given in this table represent the number of shipments intercepted in violation of the quarantine whose number appears at the top of the column, e. g. Q. 63 refers to the white-pine blister-rust quarantine; Q. 62, to the narcissus-bulb quarantine; Q. 43, to the European corn-borer quarantine, etc. Under each quarantine, the violations by commercial shippers are separated from those by noncommercial shippers, the former being indicated by C and the latter by NC. All the violations reported above were intercepted by blister-rust inspectors. In addition, 23 violations of the white-pine blister-rust quarantine and 19 violations of the narcissus-bulb quarantine were reported to the blister-rust office from outside sources.

In addition to the points shown, inspections were made for brief periods at Detroit, Indianapolis, Buffalo, Rochester, Philadelphia, and Washington.

In the conduct of this work the administration has received the hearty support of the Post Office Department and the railroad and express companies, the assistance at Chicago being especially gratifying. The express and mail employees at the larger stations set aside plant products for examination by the inspectors, and inspection tours are arranged in such a manner that no delay in dispatch is caused. Railroad employees have supplied full information in advance by telegraph and mail as to nursery-stock movement through freight terminals continuously for long periods whenever requested to do so. This assistance is a very material factor in the high percentage of shipments of plant products seen by the administration inspectors.

Increased care is being shown each season by the public and the transportation agencies concerned in determining before shipment that parcels of plant material comply in full with Federal quarantine regulations. When the first transit inspection work was done in 1920, 120 violations of Federal

quarantines were intercepted with each 10,000 plant shipments seen by the inspectors. By 1924 this proportion had been reduced to 18 violations per 10,000 plant shipments, and by 1927 to 11, a proportion which has since been approximately maintained. The improvement for commercial nurserymen is even more marked, for in 1920 89 per cent of the interceptions consisted of packages sent by commercial concerns, while in 1929 only 55 per cent were sent by such companies. The percentage in 1929 would have been much less had it not been for the change in the narcissus quarantine marking requirements, which were insufficiently understood by the bulb producers during the fall. Such misunderstandings resulted in over 200 interceptions of bulb packages from commercial producers which had not been labeled or certified in accordance with the quarantine requirements, although investigation later proved that in most cases the bulbs concerned had originally been properly inspected.

Transit inspection activities constitute an important "second line of defense" in the enforcement of domestic quarantines and in preventing the spread of pests. As elsewhere noted,

this service is especially valuable also in connection with the enforcement of other domestic quarantines. Unauthorized or uncertified shipments of articles restricted as to interstate movement under these quarantines are frequently intercepted at outside distribution points. In view of the very considerable demonstrated value of such transit inspection, the Plant Quarantine and Control Administration is requesting, in connection with its estimates for the fiscal year 1931, authority to organize this service as a separate project to cover this field not only for the blister-rust quarantine but for all other domestic-quarantine subjects.

PROTECTION OF THE BLISTER-RUST CONTROL AREAS

The States of Connecticut, Idaho, Maine, Massachusetts, Michigan, New Hampshire, New York, and Rhode Island have established, under the authority of State laws, local blister-rust-control areas, in which the planting and possession of currant and gooseberry plants are prohibited in order to make the growing of healthy white pines in such areas possible. The State of New York has also set aside certain currant and gooseberry growing areas wherein the planting of 5-leaved pines is not permitted. Since both 5-leaved pines and *Ribes* must be present together in the same localities for blister rust to develop, this separation of host plants results in the permanent protection of the pines or *Ribes* concerned.

In order to prevent the importation into these areas of the prohibited trees and plants the Federal white-pine blister-rust quarantine requires that a control-area permit must be secured from the proper officer of the State concerned before currant or gooseberry plants or 5-leaved pines may be shipped in interstate commerce into any part of the States listed. The proper officer thus has the opportunity of refusing to issue such permits when the plants are intended for movement into the blister-rust-control areas.

The list of violations shown in Table 11 includes those instances in which nurserymen or others consigned prohibited plants to States having legally established blister-rust-control areas without having secured the control-area permit required. In all such instances, the shipments were turned back to the consignor, and where real negligence appeared to have been involved, legal proceedings have been in-

stituted. No cases of deliberate intention to violate this restriction have been observed.

SANITATION REQUIREMENTS FOR PINE-PRODUCING NURSERIES IN HEAVILY INFECTED STATES

For several years the shipment of 5-leaved pines from New York and the New England States and the State of Washington was entirely prohibited on account of general infection existing in parts of those States. In the meantime, however, investigations carried on by the Bureau of Plant Industry have confirmed the effectiveness of the *Ribes*-free zone as a permanent protection to 5-leaved pine stands. Accordingly, in the last revision of the blister-rust regulations, which became effective August 15, 1928, provision was made for the interstate movement under permit of 5-leaved pines from the generally infected areas indicated into the more lightly infected States east of the Mississippi Valley quarantine line and also from Washington into Oregon and Idaho, when such pines have been raised from seed in a nursery free from currant and gooseberry plants and with a *Ribes*-free zone around the premises. The width of the *Ribes*-free zone is specified as 1 mile for European black-currant plants and 1,500 feet for other species of currants and gooseberries. This zone is required to have been maintained since the time of planting of the seed from which the pines have been grown. Inspection to determine freedom from such currant and gooseberry plants and the absence of blister rust from the nursery is also required.

Applications have been received from nine New York and New England nurseries for certification under these provisions. In five instances wild or cultivated currant and gooseberry plants were found within 1,500 feet of the nursery premises and it was necessary to withhold certification of the premises concerned. In most of these five instances the nurseries are taking steps to eliminate the *Ribes*, with the expectation that the premises will be able to qualify for this certification at some future time. In an additional pine-growing nursery, blister rust was found on the premises, and in still another instance, while no *Ribes* were found within the 1,500-foot zone, there was evidence of such *Ribes* having been present in the past since the pine seed had been planted. Certification was necessarily refused

in both the latter two cases. The two remaining nurseries from which applications have been received, one in Maine and one in Vermont, have qualified under the quarantine requirements. A permit was issued to one of these nurseries during the fiscal year and to the other shortly after its close.

THE PHONY DISEASE OF PEACH

As a result of investigations begun in 1921, the Bureau of Plant Industry last fall recommended the establishment of a quarantine against a type of infection known as the phony peach disease. A hearing on the subject was held on December 17, 1928, and a quarantine, restricting the movement of peach and nectarine trees, peach and nectarine roots, and other trees and shrubs grafted or budded on peach or nectarine roots, from the known infected area, was later issued, effective June 1, 1929.

The disease concerned is believed to have been present in Georgia for 40 or 50 years and to have been responsible for the dwarfing of certain trees, to which the name of "pony trees" was given, in the vicinity of Marshallville, Ga., during the eighties. The condition did not become extensive enough to cause alarm until 1915, but by that time enough dwarfed trees were observed in the Fort Valley area to cause one of the growers to bring the matter to the attention of the Bureau of Plant Industry. Experiments were started by the bureau in Fort Valley in 1921, but it was not until recently that the condition was definitely determined as being transmissible.

The infection now centers at Fort Valley (where over 99 per cent of the trees in some orchards have been attacked), but outlying points of infection have also been found throughout a large part of the State, covering 90 per cent of the fruit-production area of Georgia and extending west into Lee County, Ala. North of Macon, the disease is much less prevalent, from a trace to 10 per cent being present in certain districts.

The object of the hearing referred to above was to reach a decision as to the practicability of undertaking the eradication of this disease and to determine the need of quarantine restrictions to prevent its further spread as an aid in the eradication effort. It seemed evident that there must have been large opportunity for the disease to have been transmitted widely in the United States during the long period

of its existence in Georgia in view of the known distribution of nursery stock from the general area now considered infected. On the other hand, no records have been obtained of the establishment of this disease elsewhere than in Georgia except in the adjacent point in Alabama.

The decision was reached that it was desirable and advisable to attempt eradication of this disease. The eradication measures, namely, the destruction of all infected plants or orchards, are being carried out by the Bureau of Plant Industry under a specific appropriation. The work of preventing spread is being carried out by the Plant Quarantine and Control Administration under the Federal quarantine to which reference has been made.

The principal danger of spread to distant points is believed to be with the movement of nursery stock, as neither scions, seeds, nor fruit are believed to be able to carry the disease to new locations.

The important restriction under the quarantine is that peach trees, peach roots, nectarine trees, nectarine roots, and kinds and varieties of trees or shrubs grafted or budded on peach or nectarine roots when originating within a regulated area, must not be moved interstate unless they "have been produced in a nursery within which, and within 1 mile of which, no infection of the phony peach disease has existed for at least two years prior to the proposed date of movement."

BLACK STEM RUST QUARANTINE

The Bureau of Plant Industry in connection with the States concerned is undertaking, under a special appropriation from Congress, to eradicate from a group of 13 North Central States the barberry and other plants involved in the transmission of the black-stem rust disease to wheat and other small grains. The quarantine on account of this disease, enforced by the Plant Quarantine and Control Administration, is to support and aid this effort by prohibiting the movement into these States of the common barberry and related plants which harbor one phase of the disease.

The following figures on the destruction of barberry plants in these States are furnished by the Bureau of Plant Industry: During the calendar year 1928, 1,519,816 barberry bushes were found and 1,520,832 were destroyed (including about 1,000 which had been found the previous season). The to-

tal number of barberry bushes, sprouting bushes, and seedlings found since the campaign was started in 1918 is 17,592,224, and the number destroyed is 17,587,276. The first survey of the 13 States concerned is almost completed, and the bureau reports also that about 27 per cent of the area has been covered a second time.

A request for a minor modification in this quarantine so far as it relates to Mahonia, has been received from the central plant board and is being studied with a view to later action.

Ten violations of the quarantine prohibiting the interstate shipment of certain kinds of barberry and Mahonia into 13 Middle-Western grain-growing States, were intercepted and returned to the shipper by inspectors of the administration during the year.

THE WOODGATE RUST

The Woodgate rust is a disease of the Scotch pine and certain other hard pines and has, as now determined, been established for 25 or 30 years in the northern part of New York State. The possible seriousness of this disease to important elements of our remaining pine timber has only been recognized recently, however, and after due notice and public hearing a quarantine on the subject of this disease was promulgated by the Secretary of Agriculture on October 18, 1928. This quarantine prohibits the movement of Scotch pine and certain other hardwood pines from the regulated area. This area includes Clinton, Essex, Franklin, Hamilton, Herkimer, Jefferson, Lewis, Oneida, and St. Lawrence Counties, N. Y. Two heavily infected sections are known, one just southwest of the Adirondack Mountains, and the other in the extreme northeastern corner of the State. The disease is less generally distributed in other parts of the regulated area.

All hard pines appear to show a certain amount of susceptibility to Woodgate rust infection, but several important species (including red and pitch pines) have not yet been proved able to support the fungus long enough to harbor and disseminate the disease, and are therefore omitted from the list of restricted species at this time.

None of the pines now prohibited movement, namely, Scotch, Canary Island, slash, Japanese red, Corsican, stone, western yellow, Monterey, lob-

lolly, and Jersey pines, is native of this region, but several of them have been widely introduced.

Scotch pine, the species attacked with particular virulence, is a tree of great value to the Northeastern States, where it has proved successful when planted in blowing sand. The danger from Woodgate rust, however, lies less in the menace to that species than in the danger of its spreading to other regions and proving highly injurious to the extensive hard pine stands in the Southern and Western States.

The disease causes galls or swellings on the trunks and limbs of the trees attacked. The parts of the tree above the galls then die, or "brooms" are produced which destroy the value of the pine for lumber. This rust is especially difficult to control as it spreads direct from tree to tree without the intervention of an alternate host.

That this disease is an introduction into the New York area seems to be obvious, but its origin, probably in connection with some foreign introduction, has not been determined.

FOREIGN-PLANT QUARANTINES

The enforcement of the restrictions on the entry of plants and plant products under the various foreign quarantines and regulatory orders which have been promulgated by the department for the purpose of excluding new and injurious pests has been continued substantially along the lines discussed in previous reports.

This work is performed by inspectors and collaborators of the administration stationed at the more important ports of entry and its effectiveness was augmented by the splendid cooperation rendered by the customs service and the Post Office and State Departments. Since descriptive matter relating to the various foreign quarantines and regulatory orders enforced in the manner described above is available elsewhere, these quarantines are not discussed in this report except in the summary which has been given yearly of new quarantines and amendments of old quarantines, page 70. A record of the inspection work performed at the various ports of entry and elsewhere in the United States in the enforcement of foreign quarantines and of the importation of restricted plants and plant products follows.

PLANT-QUARANTINE INSPECTION

The enforcement of foreign-plant quarantines and regulatory orders at maritime, interior, and Mexican border ports of entry involves: (1) The inspection of vessels arriving at ports of entry from foreign ports and from Porto Rico and Hawaii; (2) the inspection and disposition of all plants and plant products under restriction found in passengers' baggage by the United States customs officials; (3) the inspection of all plants and plant products, including nursery stock, seeds, bulbs, fruits, and vegetables entered under permit from all foreign countries and localities and certain products arriving from domestic territory; (4) disinfection (fumigation or sterilization) of cotton and broomcorn and other products requiring such treatment as a condition of entry; (5) inspection, in cooperation with customs and post-office officials, of restricted plants and plant products arriving by foreign parcel post; (6) inspection of plants and plant products introduced by the Department of Agriculture and all plants imported under special permit in accordance with the provisions of regulation 14, quarantine 37; (7) field inspection of plants imported under special permit and grown under agreement; (8) inspection of plants (domestic) entering and leaving the District of Columbia; (9) inspection of plant-introduction gardens of the Bureau of Plant Industry; and (10) inspection of fruits and vegetables in the field and at the point of shipment in Porto Rico and Hawaii in accordance with the provisions of quarantines 58 and 13, respectively. In addition, this service inspects and certifies export fruits and vegetables to meet the sanitary requirements of certain foreign countries, and at certain ports assists flour exporters by inspecting the holds of vessels and warehouses for the presence of stored-grain insects.

The establishment of foreign air-transportation lines during the year has increased to some extent the volume of baggage inspection necessary in cooperation with the customs service. Two thousand two hundred and forty airplanes arrived from foreign countries at landing fields located at Brownsville, Tex., Miami, Fla., San Diego, Calif., and San Juan, Porto Rico. Contraband plants and plant

products were intercepted on 134 occasions. In addition to the examination, in cooperation with the customs service, of baggage arriving by airplane, the inspectors of the administration also assisted in the examination of baggage arriving on the *Graf Zeppelin* on October 15, 1928. While no contraband plants or plant products were found in the baggage or in the cargo, bouquets of flowers used for decorative purposes in passengers' quarters were found to be infested with seven species of insects and infected with two plant diseases. While the pests intercepted may not represent pests new to the United States, they attract interest in that they were among the interceptions made on the occasion of the first commercial trans-Atlantic voyage in a lighter-than-air ship.

In order to facilitate the inspection and release of plants and plant products imported under permit, and to inspect, in cooperation with customs officials, vessels, trains, etc., arriving after official hours, it was necessary for the inspectors of the administration stationed at various ports of entry to work 7,542 hours overtime, for which it was impossible to grant additional compensation.

The more important features of this inspection work are summarized below.

MEXICAN-BORDER SERVICE

Inspectors are stationed at the following 10 ports of entry along the Mexican border: Brownsville, Hidalgo, Laredo, Eagle Pass, Del Rio, and El Paso, Tex.; Douglas and Nogales, Ariz.; and Calexico and San Ysidro, Calif.

At the seven ports having rail connections with Mexico a total of 36,941 cars was inspected in the Mexican railway yards. Of these, 34,914 cars entered the United States, 16,019 of which were fumigated as a condition of entry. Two thousand four hundred and eighty-eight cars were found to be contaminated with cottonseed and were required to be cleaned before entry was permitted. A charge of \$4 is made for each car fumigated, and all fees collected are turned into the Treasury as miscellaneous receipts.

A summary of the railway-car inspection and fumigation is given in Table 12.

TABLE 12.—*Inspection and fumigation of railway cars crossing the border from Mexico, fiscal year 1929*¹

Port	Cars inspected	Cars with cottonseed	Cars entered	Cars fumigated	Fees collected
Brownsville.....	437	70	437	176	\$704
Douglas ²	1,599	67	1,599	46	184
Eagle Pass.....	3,294	750	2,702	2,196	8,500
El Paso.....	11,056	437	10,684	2,637	11,068
Laredo.....	10,596	918	9,759	7,927	32,032
Naco ³	42	0	42	42	168
Nogales.....	9,917	246	9,691	2,995	12,368
Total.....	36,941	2,488	34,914	16,019	⁴ 65,024

¹ This table does not include work performed at Del Rio. Inspectors at that port inspected 43,546 vehicles of various descriptions, 3 of which were found contaminated with cotton and fumigated as a condition of entry, fees amounting to \$1.50 were collected and turned into the Treasury.

² Does not include 1,765 loaded Mexican gondolas which crossed to the smelter, unloaded, and returned to Mexico.

³ The inspectors stationed at Douglas have performed the necessary inspections and fumigations at Naco.

⁴ The apparent discrepancy in fees collected and the number of cars fumigated may be explained by the fact that it is customary for the railroads to purchase fumigation coupons in advance.

In addition to inspecting and fumigating railway cars and vehicles entering from Mexico, the inspectors of the administration cooperate with the customs service in the inspection of baggage, personal effects, and express packages from the same country. Parcel-post packages from Mexico are inspected in cooperation with the customs service and Post Office Department. During the year under consideration 61,004 pieces of baggage and 3,986 parcel-post packages were examined. As a result of these inspections a large number of prohibited plants and plant products have been intercepted, many of which were found

to be infested with the Mexican fruit worm, pink bollworm, and other injurious insects. A list of the plants and plant products intercepted is included in Table 13.

In addition to the considerable quantities of certain fruits and vegetables which are entered for local consumption under the permit issued to the inspector in charge for this purpose, 6,011 cars of tomatoes, green peas, peppers, melons, and other vegetables, and 2,695 cars of bananas consigned to various points in the United States were inspected and permitted entry.

TABLE 13.—*Contraband plants and plant products intercepted at Mexican border ports, fiscal year 1929*

Commodity	Brownsville		Del Rio		Douglas		Eagle Pass		El Paso		Hidalgo		Laredo		Nogales		San Ysidro		Total
	Inter-ceptions	Num-ber	Inter-ceptions	Num-ber	Inter-ceptions	Num-ber	Inter-ceptions	Num-ber	Inter-ceptions	Num-ber	Inter-ceptions	Num-ber	Inter-ceptions	Num-ber	Inter-ceptions	Num-ber	Inter-ceptions	Num-ber	
Apples.....	316	1,120	35	83	257	515	158	449	446	1,417	215	670	581	2,539	270	913	2,967	2,885	10,493
Apricots.....	---	---	---	---	10	79	17	407	22	251	---	---	36	1,010	15	403	37	470	137
Avocados.....	191	739	31	101	3	7	183	743	203	812	109	490	411	2,500	29	62	19	53	5,507
Avocado seeds.....	38	141	4	53	2	5	---	---	50	135	49	123	82	608	34	1,091	2	2	2,158
Cherimoyas.....	26	41	2	6	---	---	5	108	35	61	8	14	30	49	3	18	---	---	297
Corn (ears).....	102	1,002	---	---	83	318	---	---	141	797	---	---	---	---	---	---	---	---	326
Corn (pounds).....	16	428	22	71	76	139	53	294	34	182	50	203	93	414	107	537	1	3	2,117
Cotton bolls.....	49	108	---	---	1	1	---	---	36	181	33	251	2	6	2	5	4	17	2,241
Cotton lint (pounds).....	21	8	---	---	7	11	1	---	3	3	4	8	8	21	1	1	---	---	629
Cottonseed (pounds).....	158	53	3	2	5	19	---	---	30	24	18	31	7	12	---	---	---	45	55
Dates.....	15	738	---	---	---	---	2	54	---	---	5	211	2	327	29	4,783	3	184	141
Figs.....	24	584	16	867	3	70	176	9,214	96	2,394	18	595	137	2,747	78	2,858	20	202	6,247
Grapefruit.....	249	713	---	---	8	18	2	---	13	58	245	729	43	154	22	110	125	479	568
Guavas.....	41	214	4	44	13	53	10	45	82	451	13	75	182	1,026	28	328	3	105	2,263
Kumquats.....	12	205	---	---	---	---	---	---	1	5	4	209	---	---	---	---	---	---	376
Mamey.....	57	114	7	12	---	---	8	---	98	157	36	54	58	134	2	8	---	266	497
Mangoes.....	123	347	18	66	16	30	62	191	306	791	37	94	173	768	89	294	---	824	2,581
Oranges.....	642	2,695	74	215	304	859	325	851	574	1,681	594	2,408	1,078	4,568	425	1,838	971	7,423	22,538
Papayas.....	19	26	---	---	---	---	---	---	---	---	1	1	7	13	4	6	---	31	46
Peaches.....	52	251	17	223	60	457	50	346	118	370	26	149	151	1,087	103	825	43	198	3,916
Pears.....	32	87	8	40	14	150	26	43	67	236	14	49	149	691	69	380	73	233	890
Plants.....	199	847	43	300	115	540	84	470	142	819	100	710	328	4,331	96	815	50	278	1,909
Plums.....	20	237	3	139	14	71	7	58	22	121	9	56	39	326	35	798	16	87	9,310
Pomegranates.....	68	204	14	113	17	34	65	308	47	215	35	77	170	758	161	1,145	15	87	1,893
Potatoes.....	64	651	2	11	---	---	32	145	151	2,450	50	496	88	1,139	---	---	33	904	5,942
Quinces.....	41	131	5	13	10	40	32	100	36	49	33	96	144	489	98	242	---	420	5,798
Sapotes.....	1	3	1	1	---	---	1	---	25	55	4	6	6	31	---	---	1	6	1,160
Seed cotton (pounds).....	110	3	---	---	---	---	---	---	15	3	27	59	11	43	12	63	---	39	105
Sugarcane.....	53	221	53	136	44	57	74	229	216	277	56	23	129	655	89	264	8	42	171
Sweet limes.....	11	23	2	11	42	71	16	136	52	413	16	96	122	411	99	661	---	722	1,904
Sweetpotatoes.....	18	96	8	76	44	185	37	173	100	986	8	134	41	211	43	258	11	62	2,413
Tangerines.....	60	287	---	---	---	---	---	---	1	4	78	456	16	78	1	9	86	520	1,354

MARITIME-PORIT INSPECTION

Ship inspection.—The work of ship inspection has been continued along the lines described in previous reports. Ships from foreign ports as well as from Porto Rico and Hawaii are inspected promptly upon arrival for the presence of prohibited plants and plant products in ice boxes, fruit and vegetable lockers, and passengers' and crews' quarters.

Inspectors are now stationed at the more important ports of entry, with the exception of those located in Cali-

fornia, Florida, Alabama, Mississippi, Hawaii, and several ports in Porto Rico. Inspection at these ports has been very efficiently performed by State and Territorial officials serving as collaborators of the administration at a very small cost to the department.

Table 14 indicates, by ports, the number of ship arrivals, ship inspections, and the number of ships carrying contraband plants and plant products, either in passengers' or crews' baggage, stores, cargoes, or passengers' or crews' quarters.

TABLE 14.—*Ships inspected during fiscal year 1929*

Port	From foreign ports—						From Hawaii—						From Porto Rico—					
	Direct			Via United States ports			Direct		Via				Direct		Via			
	Arrived	Inspected	With contraband	Arrived	Inspected	With contraband	Arrived	Inspected	With contraband	Arrived	Inspected	With contraband	Arrived	Inspected	With contraband	Arrived	Inspected	With contraband
Astoria ¹	75	19	14	270	36	6	4	1	0	4	4	0	0	0	0	0	0	0
Baltimore.....	754	672	350	801	771	283	0	0	0	1	1	0	13	13	5	23	23	0
Boston.....	1,400	1,138	604	341	269	56	0	0	0	1	1	0	19	19	2	0	0	0
Charleston.....	164	163	115	126	125	53	0	0	0	0	0	0	1	1	1	0	0	0
Chicago.....	11	4	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galveston.....	422	422	311	470	452	147	1	1	1	9	9	0	7	7	3	14	12	3
Gulfport ²	19	18	0	44	43	0	0	0	0	0	0	0	0	0	0	0	0	0
Houston.....	187	187	21	511	511	13	0	0	0	11	11	0	11	11	0	6	6	0
Honolulu ²	202	202	97	65	65	0	0	0	0	0	0	0	0	0	0	0	0	0
Jacksonville ²	180	180	104	129	129	49	0	0	0	0	0	0	13	13	5	0	0	0
Key West ²	1,045	1,045	306	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Miami ²	654	654	309	5	4	0	0	0	0	0	0	0	1	1	1	0	0	0
Mobile ²	287	287	108	369	368	30	2	2	1	0	0	0	8	8	2	7	7	0
Newport News ²	99	99	37	614	134	134	0	0	0	0	0	0	0	0	0	0	0	0
New Orleans.....	2,114	2,102	1,452	214	214	96	12	6	2	2	2	2	16	16	5	4	4	0
New York.....	5,074	4,074	2,182	1,101	901	364	0	0	0	0	0	0	0	154	129	43	118	86
Norfolk.....	502	461	200	1,325	1,097	320	3	3	2	1	1	1	13	13	9	13	12	0
Pascagoula ²	3	3	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Pensacola ²	92	92	19	174	174	0	0	0	0	0	0	0	0	0	0	0	0	0
Philadelphia.....	1,225	1,135	768	926	845	458	1	1	1	2	2	0	27	26	18	0	0	0
Portland, Oreg.....	211	211	129	347	347	139	4	4	3	2	2	1	0	0	0	0	0	0
Porto Rico.....	895	895	482	10	10	0	0	0	0	0	0	0	0	0	0	0	0	0
Providence.....	73	19	19	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0
San Diego ²	1,443	1,443	39	62	62	0	18	18	6	1	1	0	1	1	0	1	1	0
San Francisco ²	644	644	112	1,350	1,350	155	188	188	43	3	3	0	1	1	0	0	0	0
San Pedro ²	2,522	2,522	138	411	411	20	75	75	21	0	0	0	1	1	0	0	0	0
Savannah.....	145	137	93	44	16	3	0	0	0	0	0	0	1	1	1	0	0	0
Seattle.....	2,588	1,277	496	103	102	38	13	12	5	22	19	6	0	0	0	0	0	0
Tampa ²	357	357	67	298	298	12	0	0	0	0	0	0	12	12	0	0	0	0
Total.....	23,387	20,462	8,575	10,125	8,737	2,376	321	317	89	59	56	10	299	273	95	186	182	89

¹ No inspector at Astoria after Oct. 1, 1928.

² Collaborators stationed at these ports.

NOTE.—The foreign ship arrivals do not in all cases agree with customs figures. Foreign ships may put in for bunkers and be inspected by inspectors of the Plant Quarantine and Control Administration, but not entered by Customs. On the other hand boats entered at certain small outside ports are included in customs records but not in this report. At ports of San Francisco, San Pedro, and San Diego 128, 65, and 4, respectively, of the ships listed as from foreign ports via United States ports came by way of Hawaii; consequently these ships assume more importance from a pest-risk standpoint than ships from foreign ports via other United States ports.

Cargo inspection.—All importations of plants and plant products subject to quarantine restrictions, with the exception of special-permit plant material imported under regulation 14 of quarantine 37, which was examined in Washington, D. C., or San Francisco, Calif., were inspected at port of entry or port of first arrival. A total of 29,521 shipments was inspected, 29,353 were permitted entry, and 168 were refused entry. (Table 15.)

TABLE 15.—*Inspection of shipments of plants and plant products offered for entry, fiscal year 1929*

Port	Shipments inspected and entered under permit	Shipments refused entry
	Number	Number
Astoria ¹	0	0
Baltimore.....	495	0
Boston.....	1,959	2
Charleston.....	226	0
Chicago.....	411	2
Detroit.....	204	14
Galveston.....	157	0
Gulport ²	0	0
Houston.....	56	0
Honolulu ²	397	28
Jacksonville ²	2	0
Key West ²	1,126	2
Los Angeles ²	30	1
Miami ²	93	0
Mobile ²	173	1
Newport News ²	0	0
New Orleans.....	2,556	8
New York.....	15,767	23
Norfolk.....	213	0
Pascagoula ²	0	0
Pensacola ²	2	0
Philadelphia.....	809	29
Portland, Oreg.....	0	84
Porto Rico.....	796	0
Providence.....	94	0
San Diego ²	6	0
San Francisco ²	1,706	0
San Pedro ²	452	56
Savannah.....	58	1
Seattle.....	765	0
Tampa ²	716	1
Total.....	29,353	168

¹ No inspector at Astoria after Oct. 1, 1928.

² Collaborators are stationed at these ports.

In addition to inspection, certain commodities require disinfection as a condition of entry. Such treatment is given, under supervision of inspectors of the administration, at commercially

operated plants. Material requiring such treatment arriving during the year was as follows: Cotton, 328,356 bales (including 4,315 bales of lint-ers) and 860 packages; cotton waste, 37,134 bales and 23 packages; bagging, 710 bales; tree seeds, 8,800 pounds and 239 packages; nursery stock, 13 shipments; European chestnuts, 55,622 containers; and narcissus bulbs, imported under special permit, 12,769,835. Samples of cotton, cotton waste, and linters arriving by parcel post are also treated under similar supervision at commercial and Federal plants. During the year 1,004 such parcels arrived at approved ports other than Washington, D. C.

Considerable time was also devoted to the supervision of the cleaning by importers of products contaminated with objectionable material such as soil, and the inspection of miscellaneous cargoes, where examination was necessary to establish the true status of the shipment.

Inspections of ships' holds and docks for the presence of insects injurious to flour were performed at the ports of New Orleans, Houston, Galveston, Mobile, Pensacola, and Jacksonville. At New Orleans 152 ship and 107 dock inspections were made; at Galveston 67 ship and 6 dock inspections; at Houston 61 ship and 58 dock inspections; at Mobile 26 ship and 41 dock inspections; at Pensacola 8 ship inspections; and at Jacksonville 1 ship inspection.

INSPECTION OF SPECIAL PERMIT AND DEPARTMENTAL IMPORTATIONS

As in previous years, all plants imported under special permit have been inspected in Washington, D. C., and San Francisco. A tabular record of such importations is given on pages 58 and 59. All departmental importations and distributions from Washington, including domestic plants entering and leaving the District of Columbia, are likewise inspected and certified for shipment at the inspection house or in the nursery, freight, express, or post offices. A summary of this work is given in Table 16.

TABLE 16.—*Summary of plants and plant products offered for inspection in the District of Columbia, fiscal year 1929*

Material inspected	Foreign	Domestic	Fumi- gated	Other- wise treated	Infested with in- sects	Infected with dis- eases
Lots of seed (departmental).....	3, 276	4, 597	7, 133	322	183	37
Number of plants, bulbs, roots, rhizomes, etc. (departmental).....	17, 526	135, 094	4, 595	22, 421	1 291	1 89
Shipments of plants under regulation 14, quarantine 37 (commercial).....	1, 190	-----	132	155	130	237
Shipments of plants under regulations 3 and 15, quarantine 37 (commercial).....	676	-----	443	37	35	22
Containers of domestic plants other than departmental (mail, express, and freight) Shipments of plants for distribution by United States Botanic Garden.....	-----	11, 121	-----	-----	-----	-----
Shipments of plants by private individuals Interceptions of plants and plant products referred to Washington.....	-----	4, 054 1, 342	14	52	48	39
Cotton samples referred to Washington.....	986 15, 967	-----	537 15, 967	23	27	14

¹ Lots.

Field inspection of plants imported under special permit.—Owing to the impossibility of recognizing plant diseases in certain stages of their life histories and detecting the presence of all insects by any practical method of inspection, plants imported under special permit are, in addition to the preliminary examination made in Washington, D. C., and San Francisco, Calif., inspected in the field during two or more growing seasons for the purpose of determining whether any pests escaped attention at the time initial examination was made. This field inspection also enables the department to determine whether the plants are being used for the public-service purpose for which entry was authorized. During the year in excess of 40,000,000 plants distributed in 774 towns located in 40 States, were so examined.

FOREIGN PARCEL-POST INSPECTION

Foreign parcel-post inspection service is performed in cooperation with customs and post-office officials. Parcel-post packages from foreign countries which are found to contain plants or plant products are referred to an inspector of the administration for examination. Foreign packages arriving at ports where there are no representatives of the administration are forwarded by the postal officials to the nearest port at which an inspector is stationed.

Table 17 indicates the number and disposition of foreign parcel-post packages containing plants and plant products which were inspected during the year.

TABLE 17.—*Inspection of foreign parcel-post packages, fiscal year 1929*

Port	Inspected	Refused entry (en- tire or part)	Diverted to Wash- ington
	<i>Number</i>	<i>Number</i>	<i>Number</i>
Baltimore.....	60	13	34
Boston.....	3, 587	118	993
Charleston.....	2	0	0
Chicago.....	1, 228	399	127
Detroit.....	3, 290	271	220
Honolulu ¹	597	19	1
Jacksonville ¹	91	25	14
Key West ¹	3	0	1
Los Angeles ^{1 2}	3, 705	159	66
Miami ¹	21	19	1
New Orleans.....	29	13	14
New York.....	12, 597	474	393
Philadelphia.....	3, 400	265	249
Portland, Oreg.....	45	9	27
Porto Rico.....	29	5	0
San Diego ¹	34	0	1
San Francisco ¹	3, 544	94	101
San Pedro ¹	1	1	0
Seattle.....	337	78	8
Total.....	32, 600	1, 962	³ 2, 250

¹ Collaborators are stationed at these ports.² In addition 76 packages were diverted to San Francisco for treatment.³ The contents of 219 of these packages were either entirely or partly refused entry.

INSPECTION IN PORTO RICO AND HAWAII

Inspectors of the administration have continued to have charge of the inspection of foreign ships and plants and plant products arriving in Porto Rico. Valuable assistance has been rendered in this work by insular plant quarantine inspectors serving as collaborators of the administration. The inspectors of the administration stationed in Porto Rico have been

charged also with the enforcement of quarantine 58 which governs the movement of fruits and vegetables from that island to the mainland. Inspection of fruits and vegetables has been carried on in the fields, packing houses,

and on the docks, and all shipments moving to the mainland have been certified as to freedom from pests. Table 18 shows by month the various fruits and vegetables inspected and certified for shipment.

TABLE 18.—*Fruits and vegetables moving from Porto Rico to the mainland, inspected and certified under quarantine No. 58, July 1, 1928–June 30, 1929¹*

Item	Inspected and certified during—						
	July	August	Septem-ber	October	Novem-ber	Decem-ber	January
Avocados.....	21	164	-----	-----	-----	-----	-----
Bananas.....	1	-----	-----	-----	-----	-----	1
Chayotes.....	-----	-----	-----	-----	-----	-----	-----
Citrons.....	12	-----	-----	-----	-----	4	-----
Cucumbers.....	-----	-----	-----	-----	-----	561	1,049
Dasheens.....	-----	-----	-----	-----	-----	-----	1
Ginger.....	85	51	-----	-----	17	-----	28
Grapefruit.....	12,794	31,168	78,491	5,523½	896	3,818	2,695
Lemons.....	-----	1	110	-----	-----	-----	-----
Limes.....	47	184	-----	5	-----	-----	-----
Mixed fruit.....	1	6	2	1	1	83	3
Oranges.....	172	1,298	5,352	4,648	5,653	964	2,483
Oranges, King.....	-----	-----	-----	-----	-----	-----	1
Peppers.....	-----	-----	-----	-----	14	117	200
Pineapples.....	14,663	20,002	6,547	2,291	7,067	6,329	12,451½
Plantains.....	-----	-----	-----	1	-----	-----	-----
Pumpkins.....	5	-----	-----	-----	-----	5	64
Squash.....	-----	-----	-----	-----	-----	53	132
Tangerines.....	-----	-----	-----	-----	6½	-----	470
Tomatoes.....	-----	-----	-----	-----	438	99	-----
Total.....	27,801	52,874	90,502	12,469½	14,092½	12,033	19,578½
Certificates issued.....	208	275	237	129	163	152	207

Item	Inspected and certified during—					Total
	February	March	April	May	June	
Avocados.....	-----	-----	-----	-----	-----	185
Bananas.....	-----	-----	-----	-----	-----	1
Chayotes.....	-----	-----	-----	-----	-----	1
Citrons.....	-----	-----	-----	-----	-----	16
Cucumbers.....	171	54	1	-----	-----	1,836
Dasheens.....	20	23	-----	1	7	52
Eggplants.....	-----	33	170	-----	-----	203
Ginger.....	51	3	18	43	55	351
Grapefruit.....	1,548	1,257	5,972	2,411	5,784	152,357½
Lemons.....	-----	-----	-----	-----	-----	111
Limes.....	-----	-----	-----	-----	-----	236
Mixed fruit.....	2	1	1	4	1	106
Onions.....	-----	25	-----	-----	-----	25
Oranges.....	48	1	35	-----	1	20,655
Oranges, King.....	-----	3	-----	-----	-----	4
Peppers.....	386	292	320	234	19	1,582
Pineapples.....	3,734	7,511	82,025	282,946	62,314	507,880½
Plantains.....	-----	-----	-----	-----	1	2
Pumpkins.....	172	81	-----	15	11	353
Squash.....	118	-----	-----	-----	-----	303
Tangerines.....	-----	-----	-----	-----	-----	476½
Tomatoes.....	105	-----	3	-----	-----	645
Watermelons.....	5	62	63	-----	-----	130
Total.....	6,360	9,346	88,608	285,654	68,193	687,511½
Certificates issued.....	153	116	230	438	236	2,544

¹ Bananas by bunches, remainder by containers.

The work in Hawaii relates principally to the enforcement of quarantine 13 on account of the Mediterranean fruit fly and the melon fly, and consists of the field and packing-house inspection and certification of fruits and vegetables destined for the mainland. A summary of the fruits and vegetables inspected and certified appears in Table 19.

As an accommodation to passengers leaving Hawaii for the mainland of

the United States a baggage-inspection service is maintained at Honolulu and Hilo. Baggage of passengers leaving on ships plying between Honolulu and mainland ports only is inspected and sealed, thus eliminating delay incident to baggage inspection at destination. Two thousand two hundred and fifty-two pieces of baggage were inspected and sealed during the year.

TABLE 19.—*Fruits and vegetables inspected and certified for shipment from Hawaii to the mainland, fiscal year 1929*

Month	Bananas ¹	Pine-apples	Taro	Coconuts	Ginger root	Lily root	Certificates issued
July.....	12, 559	931	97	37	80	272	164
August.....	19, 842	944	33	22	67	454	193
September.....	13, 334	395	389	96	160	331	136
October.....	15, 840	139	1, 284	16	77	381	235
November.....	15, 877	621	413	413	192	266	143
December.....	19, 495	1, 017	283	473	308	369	157
January.....	23, 055	1, 170	18	283	260	325	164
February.....	13, 100	920	28	16	71	357	142
March.....	13, 306	981	1	179	54	298	166
April.....	13, 638	285	37	257	244	280	140
May.....	10, 987	1, 325	17	169	197	236	183
June.....	12, 217	1, 537	120	9	16	190	154
Total.....	183, 250	10, 265	2, 720	1, 970	1, 726	3, 759	1, 977

¹ Bananas by bunches; the other commodities by containers.

INSPECTION OF PLANT INTRODUCTION AND PROPAGATING GARDENS

As heretofore, plants for distribution by the Bureau of Plant Industry from its field introduction and propagating gardens were inspected and certified prior to shipment. Plants shipped from Mandan, N. Dak., and Chico, Calif., were inspected by offi-

cials of the States concerned serving as collaborators of the administration. Those distributed from Chapman Field, Fla., and Savannah, Ga., were examined by inspectors of the administration in cooperation with officials of the States of Florida and Georgia likewise serving as collaborators. Table 20 indicates the number of plants inspected and certified for distribution.

TABLE 20.—*Summary of plants, bud sticks, cuttings, tubers, roots, and seeds examined for distribution from plant-introduction and propagating gardens, fiscal year 1929*

Station	Plants	Bud sticks, cuttings, tubers, and roots	Shipments of seeds
	Number	Number	Number
Bell.....	24, 758	1, 114	-----
Chico.....	19, 700	10, 880	297
Chapman Field.....	6, 784	424	308
Savannah.....	23, 410	1, 284	16
District of Columbia.....	8, 288	24, 948	14, 208
Mandan, N. Dak.....	524, 115	-----	-----
Total.....	607, 055	38, 650	14, 829

PESTS INTERCEPTED

During the fiscal year the inspectors and collaborators of the administration collected on or in imported plants and plant products 535 recognized species of insects and 454 insects which could be assigned to family or genera only, 10 species of nematodes, and 91 recognized species of fungi and bacteria; and in addition several interceptions of nemas and plant diseases which could be classified only to genera. Many of these interceptions were of considerable economic importance.

The West Indian fruit fly (*Anastrepha fraterculus*) was taken in guava and mango from Cuba, mango from Honduras, and mango and sapodilla from Jamaica; the Mexican fruit fly (*Anastrepha ludens*) in avocado, grapefruit, guava, mamey, mango, orange, pomegranate, sapote, and star-apple from Mexico; *Anastrepha serpentina* in sapodilla from Curacao; *Anastrepha striata* in mango from Honduras; *Anastrepha* sp. in mango from Cuba and Jamaica, and sapodilla from Salvador. The melon fly, (*Bactrocera cucurbitae*) was intercepted in string beans from Hawaii. The Mediterranean fruit fly (*Ceratitidis capitata*) was taken in peaches from France, pear from Greece, papaya from Hawaii, orange and tangerine from Italy, loquat from Madeira Islands, and pomegranate from Spain. Trypetid larvæ were taken in mandarin from India, orange from Italy, pricklypear from Madeira Islands, quince from Greece, and in a package of sapodilla seed from British Honduras.

The pink bollworm (*Pectinophora gossypiella*) was intercepted in cottonseed in restricted bagging from Belgium, and in cotton bolls from India, Hawaii, and Mexico. The vine moth (*Polychrosis botrana*) was found in fresh grapes from Italy. The sugarcane moth borer of India (*Chilo simplex*) was intercepted in rice straw from Japan. Turnips from England, France, Germany, and the Netherlands were infested with the turnip gall weevil (*Ceutorhynchus pleurostigma*). *Brachycerus albidentatus* was taken in garlic from Italy. *Cylas turcippennis* was taken in sweetpotatoes from Japan. Lima and string beans from Cuba were infested with the bean pod borer (*Maruca testulalis*). *Stenomona anonella* was taken in sour sop from Honduras. *Apion carduorum* was taken in artichokes from Italy. The West Indian sweetpotato weevil (*Euscepes ba-*

tatae) was found infesting sweetpotatoes from Brazil and Porto Rico and yam from Brazil and Barbados. *Psylliodes chrysocephala* was intercepted in turnips from England, *Palaeopus costicollis* in yams from Jamaica. *Heilipus perseæ* in avocados from the Canal Zone, and *Heilipus* sp. in avocados from the Canal Zone and Honduras. Mango seed from Hawaii was infested with the mango weevil (*Sternonchetus mangiferae*). *Balaninus* sp. was found infesting chestnuts from China, Italy, Japan, Spain, and Switzerland. *Laspeyresia splendana reaumurana* was taken in chestnuts from France, Italy, Japan, and Spain; and *Laspeyresia* sp. in chestnuts from Italy and Japan. The lesser bulb fly (*Eumerus strigatus*) was intercepted in onions from Canada, the Netherlands, and Spain; lily from France and the Netherlands; and hyacinth, iris, and narcissus from the Netherlands. *Eumerus* sp. was taken in onions from Germany and the Netherlands, lily from France, hyacinth from the Netherlands, and narcissus from Germany and the Netherlands. *Merodon* sp. arrived with hyacinth from France and the Netherlands and with narcissus from France.

The sorrel cutworm (*Acronycta rumicis*) was intercepted on apple, Mahaleb, and pear from France and Multiflora (rose) stocks from the Netherlands; *Acronycta* sp. on cherry, Myrobalan, pear, and quince stocks from France; and the white tree pierid (*Aporia crataegi*) on apple and plum stocks from France. *Calophasia lunula* was intercepted on apple and pear from France and on Manetti from the Netherlands. The European tussock moth (*Notolophus antiqua*) was found on apple, Mahaleb, Myrobalan, and pear stocks from France and on cherry and rose stocks from the Netherlands. The sawfly (*Emphytus cinctus*) was taken in Manetti from England, France, Ireland, and the Netherlands, and in Multiflora from France. *Empria* sp. (sawfly) was taken in Manetti from Ireland.

The bulb eelworm (*Tylenchus dipsaci*) was intercepted in onion and narcissus from the Netherlands, and in cut flowers, leaves, and seed pods of narcissus from Canada. Grapefruit and oranges from China and limes from India were found infected with citrus canker (*Bacterium citri*). A canker, *Botryosphaeria dothidiae*, was intercepted on roses from Switzerland. Water chestnuts from China were infected with *Ceratostomella* sp. The

leaf spot (*Cercospora ricinella*) was intercepted on castor beans from Mexico; *Cercospora albo-maculans* on Chinese cabbage from Japan; *Colletotrichum falcatum* on sugarcane from Cuba; *Fusicladium orbiculatum* on mountain ash from Germany; *Gymnosporangium japonicum* on Chinese juniper from Japan; *Oidium euonymi-japonici* on *Euonymus* sp. from Japan; *Oospora pustulans* on potatoes from England, Ireland, New Brunswick, and Norway. Oranges from China and Japan were infected with black spot (*Phoma citricarpa*); and grapefruit from Bahamas, Cuba, Formosa, and Porto Rico, and oranges from Argentina, Bahamas, Brazil, Japan, and Peru, showed the presence of melanose (*Phomopsis citri*); *Puccinia allii* in-

fecting leek from France and garlic from Algeria and Italy. Chincheriee rust (*Puccinia kalchbrenneriana*) was found on chincheriee from South Africa. Rice from Japan was infected with a smut (*Tilletia horrida*).

A total of 5,461 interceptions of insects and plant diseases was forwarded to Washington for determination by inspectors and collaborators during the fiscal year. In addition, the collaborators in California, Florida, and Hawaii made 2,471 interceptions of insects and 11 of diseases, 346 interceptions of insects and 245 of diseases, and 252 interceptions of insects and 1 of diseases, respectively, which were identified by State and insular authorities. (Table 21.)

TABLE 21.—Number of interceptions of insects and plant diseases forwarded to Washington for identification, fiscal year 1929

Port	Cargo		Stores		Baggage		Mail		Quarters		Total	
	In-sect	Dis-ease	In-sect	Dis-ease	In-sect	Dis-ease	In-sect	Dis-ease	In-sect	Dis-ease	In-sects	Dis-eases
Astoria ¹	0	0	2	1	0	0	0	0	0	0	2	1
Baltimore.....	26	6	9	12	5	10	0	0	4	0	44	28
Boston.....	31	5	50	18	43	3	17	0	9	1	150	27
Brownsville.....	3	0	1	0	26	3	0	0	0	0	30	3
Charleston.....	102	3	95	75	0	0	0	0	9	2	206	80
Chicago.....	6	1	0	0	0	0	4	1	0	0	10	2
Cincinnati.....	3	0	0	0	0	0	0	0	0	0	3	0
Del Rio.....	1	0	0	0	4	0	0	0	1	0	6	0
Detroit.....	38	25	0	1	53	17	21	9	0	0	112	52
Douglas.....	1	0	0	0	2	0	0	0	0	0	3	0
Eagle Pass.....	4	0	0	0	7	0	0	0	0	0	11	0
El Paso.....	5	0	0	0	35	2	3	0	0	0	43	2
Galveston.....	2	0	0	0	0	0	0	0	0	0	2	0
Hawaii.....	201	0	1	0	53	1	14	0	12	0	281	1
Hidalgo.....	0	0	0	0	12	3	0	0	0	0	12	3
Laredo.....	1	0	0	0	9	0	1	0	0	0	11	0
Mobile.....	3	0	5	0	3	1	1	0	0	0	12	1
New Orleans.....	292	13	53	35	20	6	1	2	19	5	385	61
New York.....	647	92	25	8	75	17	37	11	3	0	787	128
Nogales.....	1	1	0	0	0	0	0	0	0	0	1	1
Philadelphia.....	395	130	631	130	20	5	174	33	159	25	1,379	323
Portland, Oreg.....	24	1	3	0	0	0	2	1	0	0	29	2
San Francisco.....	22	0	0	0	4	0	0	0	3	0	29	0
San Juan.....	5	0	1	0	2	0	2	0	0	0	10	0
San Pedro.....	1	0	0	0	0	0	0	0	0	0	1	0
Savannah.....	1	0	0	0	0	0	0	0	0	0	1	0
San Ysidro.....	1	1	0	0	2	0	0	0	0	0	3	1
Seattle.....	91	24	51	25	84	18	11	6	47	7	284	80
St. Louis.....	0	0	0	0	0	0	2	0	0	0	2	0
Washington, D. C., inspection house.....	231	193	0	0	3	0	235	146	0	0	469	339
Miscellaneous.....	6	2	0	0	0	0	0	0	0	0	6	2
Total.....	2,144	497	927	305	462	86	525	209	266	40	4,324	1,137

¹ No inspector at Astoria after Oct. 1, 1928.

NOTE.—Inspectors stationed in Porto Rico made 53 interceptions of insects and 2 of diseases during their field and packing-house inspection of fruits and vegetables for shipment to the mainland.

INTERCEPTIONS OF PROHIBITED PLANTS
AND PLANT PRODUCTS

A total of 19,934 interceptions of prohibited plants and plant products was made during the year. Fourteen thousand four hundred and four of these interceptions were made in

baggage, 1,884 in mail, 125 in cargo, 949 in ships' stores, 1,478 in quarters, 998 in appraisers' stores, and 96 in Porto Rican express. Table 22 indicates by port the number of interceptions of contraband plants and plant products.

TABLE 22.—Number of interceptions of contraband plants and plant products, fiscal year 1929

Port	In baggage	In mail	In cargo	In stores	In quarters
Astoria ¹	0	0	0	0	0
Baltimore.....	3	4	1	2	42
Boston.....	237	160	1	3	4
Charleston.....	2	0	2	13	32
Chicago.....	0	414	0	0	0
Detroit.....	154	302	22	0	0
Galveston.....	23	0	0	25	2
Gulfport ²	0	0	0	0	0
Houston.....	172	0	2	23	0
Honolulu ²	4,942	34	2	0	0
Jacksonville ²	1	16	0	49	2
Key West ²	2,295	0	0	0	0
Los Angeles ²	0	64	2	0	0
Miami ²	1,487	10	0	85	427
Mobile ²	12	0	1	30	33
Newport News ²	0	0	0	0	0
New Orleans.....	499	1	4	127	370
New York ³	2,538	416	28	1	58
Norfolk.....	0	0	0	0	0
Pascagoula ²	0	0	0	0	0
Pensacola ²	0	0	0	24	0
Philadelphia.....	81	337	20	148	223
Portland, Oreg.....	1	10	0	1	2
Porto Rico.....	229	0	1	13	19
Providence.....	289	0	0	0	0
San Diego ²	57	0	0	40	24
San Francisco ²	615	73	26	215	153
San Pedro ²	92	1	1	114	33
Savannah.....	0	0	0	0	0
Seattle.....	666	42	0	0	0
Tampa ²	9	0	12	36	54
Total.....	14,404	1,884	125	949	1,478

¹ No inspector at Astoria after Oct. 1, 1928.

² Collaborators are stationed at these ports.

³ In addition 998 interceptions were made in appraisers stores and 96 in Porto Rican express.

RECORDS OF IMPORTS OF RESTRICTED
PLANTS AND PLANT PRODUCTS

Under various foreign quarantines certain plants and plant products are restricted as to entry and made subject to inspection and, if necessary, disinfection, for the purpose of excluding various plant diseases and insect pests. Among these restricted plants and plant products are nursery stock, plants and seeds for propagation, fruits and vegetables, grains from certain countries, broomcorn, cotton, cotton waste, cotton wrappings, and cottonseed products. The records of the importations of these articles are indicated in the discussion and tables following.

Importations of nursery stock, plants, and seeds.—The importations recorded in Tables 23 to 27, inclusive, are entered under regulation 3 of quarantine 37, under permits which are made continuing and unlimited as to the quantity that may be imported. The restrictions under this regulation are intended merely to afford opportunity to inspect, and if necessary, to safeguard the products as they are entered. In the case of Table 23, the entries made during the preceding year are also listed for the purpose of comparison, and in Table 27 the bulb entries of the preceding eight years are brought together to show the fluctuation in the entry of different classes of bulbs.

TABLE 23.—*Importation of fruit, rose, and nut stocks, cuttings, and scions under regulation 8, quarantine 87, year ended June 30, 1929*
 [Figures indicate number of plants]

Kind of stocks, cuttings, and scions	Arabia	Australia	Belgium	Canada	Chile	China	Czechoslovakia	Egypt	England	France	Germany	Greece
Apple.....			100	573			238		2, 186	2, 223, 750		
Apricot.....		60								6, 549, 550		
Cherry.....						39					29	10
Fig.....	16		120	12	107			26		103	330	
Grape.....				69					33	25, 300		25
Nut.....			125						100	1, 008, 100		
Olive.....									6	919, 700		
Pear.....			50			16			430	288, 750		
Plum.....									2, 880, 800	1, 498, 100		
Quince.....												
Rose.....												
Total.....	16	60	395	654	107	55	238	26	2, 883, 555	12, 513, 353	359	35

Kind of stocks, cuttings, and scions	Nether-lands	India	Ireland	Italy	Scotland	Switzer-land	Syria	Turkey	Total	
									1928-29	1927-28
Apple.....				3		7, 510			2, 234, 360	14, 251, 221
Apricot.....									60	
Blackberry.....										
Cherry.....	59, 900					1, 000			6, 610, 489	7, 103, 017
Fig.....				3, 206			85	43	4, 055	27, 274
Grape.....		50								200
Medlar.....										25
Mulberry.....									25, 402	24, 750
Nut.....									25	
Olive.....									3	50
Peach.....				3					1, 021, 325	11, 598, 481
Pear.....						13, 000			2, 000	
Persimmon.....				2, 000					925, 706	1, 028, 953
Plum.....	5, 000					1, 000			2, 000	46
Prune.....						2, 000			289, 246	540, 930
Quince.....									10, 991, 337	10, 505, 436
Rose.....	6, 466, 337				25, 000					
Total.....	6, 531, 237	50	121, 100	5, 212	25, 000	24, 510	85	43	22, 106, 090	125, 050, 441

¹ Errors found in 1927-28 reports and totals corrected accordingly.

TABLE 24.—*Importation of bulbs under regulation 3 of quarantine 37, year ended June 30, 1929*

[Figures indicate number of bulbs]

Bulb	Bermuda	Canada	China	England	France	Germany	Netherlands	India	Ireland	Japan	Philippine Islands	Scotland	Switzerland	Total
Chionodoxa	-----	-----	-----	886	-----	-----	486,342	-----	-----	-----	-----	-----	-----	487,228
Convallaria	-----	-----	-----	412	-----	-----	727,930	-----	-----	-----	-----	-----	-----	23,087,167
Crocus	-----	-----	-----	4,060	-----	22,358,825	9,882,486	-----	-----	-----	-----	-----	-----	9,886,546
Eranthis	-----	-----	-----	124	100	-----	143,368	-----	-----	-----	-----	-----	-----	143,592
Fritillaria	-----	-----	-----	28	-----	-----	115,630	-----	-----	-----	-----	-----	-----	115,638
Galanthus	-----	-----	-----	6,822	-----	-----	711,308	-----	-----	-----	-----	-----	-----	718,130
Hyacinth	-----	-----	-----	24	685,423	-----	20,765,100	-----	-----	-----	-----	-----	-----	21,450,547
Ixia	-----	-----	-----	-----	-----	-----	827,154	-----	-----	-----	-----	-----	-----	827,154
Lily	-----	280	19,523	7,496	758,100	23,732	502,317	1,612	12	18,923,330	1,000	40	-----	21,453,024
Muscari	-----	-----	-----	1,000	100	-----	1,638,882	-----	-----	-----	-----	-----	-----	1,639,982
Scilla	-----	-----	-----	400	-----	-----	1,436,584	-----	-----	-----	-----	-----	4	1,436,988
Tulip	-----	100	-----	276,004	86,650	-----	191,596,408	-----	-----	-----	-----	-----	-----	191,959,162
Total	-----	380	19,523	297,256	1,530,373	22,382,557	228,833,509	1,612	12	18,923,330	1,000	40	4	273,205,178

TABLE 25.—Summary of bulb importations under regulation 3, quarantine 37, for the years 1922 to 1929

Figures indicate number of bulbs

Bulb	1922	1923	1924	1925	1926	1927	1928	1929
Chionodoxa ¹			339,766	465,422	839,637	466,872	439,075	487,228
Convallaria	14,951,170	19,603,092	17,568,335	18,980,311	20,543,785	20,558,460	24,738,880	23,087,167
Crocus	6,319,082	8,286,500	10,815,920	10,624,670	10,898,968	9,969,070	8,775,467	9,886,546
Franchia ¹			93,314	152,787	214,173	144,150	135,842	143,592
Fritillaria ¹			92,951	104,483	209,543	125,688	111,778	115,658
Galanthus ¹			797,381	895,003	1,128,335	844,544	662,989	718,130
Hyacinth	24,808,236	29,142,797	32,197,740	27,947,261	23,682,560	23,711,178	22,127,888	21,450,547
Ixia ¹			335,158	371,983	545,278	529,404	704,644	827,154
Lily	8,219,460	9,145,630	9,690,486	11,207,559	16,031,090	16,228,762	19,917,477	21,453,024
Muscari ¹			612,329	906,259	1,404,573	(²)	(²)	(²)
Narcissus	77,270,548	77,193,281	92,659,666	106,314,049	142,384,199	93,339	1,150,220	1,639,982
Scilla ¹			994,762	1,742,514	2,012,750	1,553,313	1,341,685	1,436,988
Tulip	64,846,940	76,719,116	92,539,157	96,290,452	106,849,572	129,681,086	161,940,818	191,939,162
Unclassified	70,750	183,900				11,112		
Total	196,486,186	220,274,316	258,737,465	276,002,753	326,744,463	204,816,928	242,046,763	273,205,178

¹ Imported under regulation 14, quarantine 37, from June 1, 1919, to January 1, 1923.² Imported under regulation 14, quarantine 37, since January 1, 1926.

TABLE 26.—*Importation of tree seeds under regulation 3, quarantine 37, year ended June 30, 1929*

[Figures indicate number of pounds]

Country of origin	Apple	Apricot	Banana	Cherry	Grape	Nut palm	Orna- mental and tree	Peach	Pear	Per- simmon	Plum	Quince	Rose	Miscel- laneous	Total
Africa.....						1	13								14
Austria.....	475			1,602		72	12,291		100	5	225		1		14,771
Australia.....						22,158	125								22,283
Brazil.....						302	71								373
British Honduras.....							3								3
Canada.....							3,612								3,612
Canary Islands.....			2			8	20								20
Ceylon.....						1,388	11								21
China.....						21	16		175	100			1		4,863
Cuba.....															21
Czechoslovakia.....							4,416								4,416
Denmark.....						1,133	1,133								4,416
England.....						3	2								1,133
Finland.....							17								5
France.....	12,485		11	1,561		104	4,804		893	30			95	3	19,891
Germany.....							1,412								1,507
Guam.....				5											5
Netherlands.....							154								154
Hungary.....						6	35								2
India.....		8				15	2,383								41
Italy.....				778	3	456	8,910		804	163		36	117		2,406
Japan.....			40				48								11,267
Mexico.....						112	362								88
New Zealand.....							10								474
Norway.....							3								10
Palestine.....						2	7								3
Philippine Islands.....							135								9
Poland.....							1								1
Spain.....				1										5	140
Switzerland.....															1
Trinidad.....						144	93								144
Union of Socialistic Soviet Republics.....						1	11								94
Yugoslavia.....															11
Total.....	12,960	8	53	3,947	3	24,793	42,199	1,100	1,972	298	225	36	213	9	87,816

NOTE.—In addition to the seeds above indicated in pounds, 164 packets of miscellaneous seeds were imported from numerous sources. These packets contained seeds ranging in weight from a fraction of an ounce to several ounces.

The record of entry under special permits issued under the provisions of regulation 14 of quarantine 37 for the purpose of keeping the country supplied with new varieties and necessary propagating stock and to meet other technical and educational needs is given in Table 28.

TABLE 28.—*Special-permit importations, 1929, with combined total for the period 1920-1929*

Class of plants	Fiscal year 1929				Total, 1920-1929			
	Permits issued		Importations under permits		Permits issued		Importations under permits	
	Num-ber	Quantity	Num-ber	Quantity	Num-ber	Quantity	Num-ber	Quantity
Gladiolus.....	178	596,782	170	463,087	1,507	50,487,506	1,250	28,508,843
Dahlia.....	57	3,835	54	3,757	603	48,136	501	33,586
Iris, rhizomatous.....	110	7,730	115	8,602	1,253	262,168	1,075	135,281
Iris, bulbous.....	109	4,723,511	138	4,119,775	1,190	44,997,338	994	31,541,831
Miscellaneous bulbs, roots, etc.....	152	453,626	138	377,774	1,297	12,490,546	1,024	6,454,665
Peony.....	91	19,795	82	26,699	1,051	1,368,882	839	659,509
Rose.....	127	21,776	107	18,905	1,035	216,025	861	155,853
Orchid.....	165	11,898	160	12,066	1,229	186,620	1,083	140,713
Ornamental.....	219	151,092	170	121,151	1,449	3,224,951	1,133	2,103,400
Herbaceous.....	111	59,843	87	49,646	1,162	4,719,759	915	2,927,969
Fruit (trees and small fruits).....	11	403	13	350	140	15,050	95	7,011
Narcissus.....	208	10,929,737	270	12,769,835	896	146,270,646	711	69,047,197
Total.....	-----	16,979,528	-----	17,971,647	-----	264,287,627	-----	141,715,858

NOTE.—The disparity in the number of bulbs, plants, etc., imported as compared with the number authorized entry may be explained by the fact that a number of the plants imported during the fiscal year 1929 were entered under permits issued during the fiscal year 1928.

During the year 1,353 such permits were issued authorizing the entry of 16,979,528 plants and bulbs. A total of 17,971,647 plants and bulbs was imported under 1,348 permits as compared with a total of 24,643,420 plants and bulbs imported during 1928. Narcissus importations decreased from 15,869,180 to 12,769,835, bulbous iris from 6,349,134 to 4,119,775, gladiolus from 1,598,697 to 463,087 and orchids from 22,110 to 12,066 as compared with importations of these classes in 1928, while importations of roses increased from 9,460 to 18,905. A summary of special permits issued during the entire period of the quarantine to date is given in Table 29.

The number of varieties considered has now reached a total of 45,939 (an increase of nearly 4,000 during the year), of which 43,949 have been approved for entry. Table 30 shows the distribution of these varieties among the various classes of plants, as well as a comparison of the 1929 importations with those of 1928 for each class. The distribution of the imported spec-

ial permit material by States is shown in Table 31.

TABLE 29.—*Special-permit importations, yearly totals, 1920-1929*

Fiscal year	Permits issued		Importations under permits	
	Num-ber	Quantity	Num-ber	Quantity
1920.....	311	10,752,844	171	3,484,195
1921.....	622	13,965,013	411	8,132,634
1922.....	750	9,573,199	518	3,344,026
1923.....	897	15,175,003	719	10,357,406
1924.....	1,107	15,381,621	862	12,561,306
1925.....	1,235	9,517,913	1,087	8,575,129
1926.....	1,445	80,982,954	1,200	6,021,508
1927.....	1,453	54,006,343	1,256	46,624,587
1928.....	1,602	37,953,209	1,357	24,643,420
1929.....	1,353	16,979,528	1,348	17,971,647
Total....	10,775	264,287,627	8,929	141,715,858

NOTE.—The disparity in the number of bulbs, plants, etc., imported as compared with the number authorized entry may be explained by the fact that a number of the plants imported during the fiscal year 1929 were entered under permits issued during the fiscal year 1928.

TABLE 30.—*Special-permit material: Number of different varieties of plants requested and approved for fiscal years 1920-1929, and comparison of importations for fiscal years 1928 and 1929*

Class of plants	Varieties of plants requested and approved, 1920-1929			Comparison of importations	
	Requested	Approved	Percentage approved	1928	1929
Gladiolus.....	1,662	1,528	91.94	1,598,697	463,087
Dahlia.....	3,075	2,932	95.35	2,881	3,757
Iris, rhizomatous.....	2,577	2,460	95.46	8,069	8,602
Iris, bulbous.....	508	507	99.80	6,349,134	4,119,775
Miscellaneous bulbs, roots, etc.....	2,881	2,858	99.20	604,207	377,774
Peony.....	2,097	1,854	88.41	24,521	26,699
Rose.....	4,143	3,728	89.98	9,460	18,905
Orchid.....	8,803	8,770	99.69	22,110	12,066
Ornamental.....	12,303	11,644	94.64	98,368	121,151
Herbaceous.....	6,178	5,978	96.76	54,177	49,646
Fruit (trees and small fruits).....	314	301	95.86	2,616	350
Narcissus.....	1,398	1,383	98.92	15,869,180	12,769,835
Total.....	45,939	43,949	95.67	24,643,420	17,971,647

TABLE 31.—*Distribution of special-permit material by States for fiscal years 1920-1929*

State	Gla olius	Dahlia	Rhizo- matous iris	Bulbous iris	Miscel- laneous bulbs, roots, etc. ¹	Peony	Rose	Orchid	Orna- mental	Herba- ceous ¹	Fruit ¹	Narcissus	Total
Alabama.....	14, 988	14		30, 980			174	14	198			6, 000	52, 340
Arizona.....	12						9		2, 560			1, 000	3, 609
Arkansas.....				18, 000									18, 000
California.....	1, 922, 198	5, 984	29, 058	10, 774, 841	54, 712	2, 272	37, 499	34, 312	2, 081, 213	623	232	5, 521, 253	20, 464, 197
Colorado.....	28, 494			33, 490		150		1, 831	5, 787	100			69, 852
Connecticut.....	15, 879	1, 038	1, 323	22, 745	436	113	31, 508	118	151, 407	1, 292			258, 044
Delaware.....	2, 000			169, 300		1, 016		1, 343	5, 310	14			179, 033
District of Columbia.....	516	166	93	215			320	134	318			26	1, 788
Florida.....	48, 860			306, 617	84, 394		21	86	278, 034			6, 913, 742	7, 631, 742
Georgia.....	9, 210	360	181	171, 485	80				3, 075		2	11, 696	196, 089
Idaho.....	791		24	2, 534	180							3, 529	
Illinois.....	3, 254, 499	95	14, 686	881, 390	211	44, 993	9, 947	594	226, 638	2	1	221, 025	4, 654, 081
Indiana.....	2, 389, 804	186	2, 917	502, 730	7, 010	5, 995	2, 399	244	30, 158	198		1, 004	2, 942, 645
Iowa.....	112, 201		6	10, 035	180	24, 012		14, 295	14, 475			250	160, 979
Kansas.....		99	2, 082	32	90	3, 059				92		111	5, 948
Kentucky.....		408		51, 200		124		415	3			301	52, 543
Louisiana.....	2, 500	116		21, 750			36	1, 332	431			10, 363	36, 528
Maine.....	350		40		275	262						1, 829	
Maryland.....	23, 057	439	413	447, 075		19, 942	500	522	64, 348			1, 055, 863	1, 612, 159
Massachusetts.....	3, 439, 331	1, 339	3, 414	499, 749		6, 478	2, 836	24, 543	436, 471	134		101, 680	4, 518, 679
Michigan.....	12, 374, 085	4, 453	3, 404	1, 057, 766	7, 262	85, 809	317	542	572, 775	6, 715		2, 346, 663	16, 459, 891
Minnesota.....	86, 238	49	2, 145	99	11	7, 445	160	665	35, 621			11, 000	143, 433
Mississippi.....	6, 500	49	9	49, 776	5				252			5, 175	61, 766
Missouri.....	3, 173	249	599	281, 211	14	991		4, 213	19, 645	55		1, 766	311, 376
Montana.....	32								100			1, 226	
Nebraska.....	1, 132	276				14			351				1, 773
Nevada.....													
New Hampshire.....	40, 053	7	28	21, 654	257			31	1, 317	5		12	63, 364
New Jersey.....	116, 793	5, 341	10, 053	1, 083, 169	6, 354	39, 542	33, 479	23, 937	2, 652, 860	9, 443	1	488, 119	4, 409, 091
New Mexico.....				5, 000									5, 000
New York.....	2, 638, 956	4, 568	34, 037	5, 037, 455	127, 455	218, 074	19, 606	31, 472	3, 019, 269	28, 103	50	12, 936, 132	24, 094, 863
North Carolina.....	769, 375	82		3, 432, 828	10, 500			156	751			1, 281, 305	5, 494, 997
North Dakota.....	24, 679					7							24, 687
Ohio.....	483, 555	2, 074	20, 573	46, 868	1, 108	126, 663	4, 421	457	764, 752	1, 321	64	51	1, 451, 907
Oklahoma.....	510			14, 000					198			14, 798	
Oregon.....	71, 942	1, 438	1, 409	778, 954	58, 555	2, 667	1, 406		54, 987	134		1, 781, 991	2, 753, 463
Pennsylvania.....	390, 168	1, 493	2, 519	211, 993	10, 725	51, 828	6, 796	12, 630	253, 924	138		3, 098, 882	3, 970, 996
Rhode Island.....	946	1, 067	1, 557	257, 965		5, 209	529	157	46, 128			226, 800	250, 358
South Carolina.....				252, 500								8, 889, 490	9, 141, 993
South Dakota.....			11			2, 432	2, 300		551				5, 966
Tennessee.....	672	607	556	193, 896		2, 232	87		3, 442			832, 805	1, 031, 625
Texas.....	2, 000	1	50	745, 671			290	6	76, 135	8		7, 716, 063	8, 540, 224

Utah.....	50	30,750	2,339	155,853	140,713	11,063,275	49,046	350	69,047,197	141,715,858
Vermont.....	11,324	8,010	36	36	36	4,747	2,445	44,456	5,249,324	46,764
Virginia.....	20,335	2,409,304	3	3	3	159,887	147	159,887	10,095,294	24,174
Washington.....	145,639	1,567,138	3,533	3,533	5,066	36	49,020	1,122	269,250	7,725,231
West Virginia.....	230	4,000	266	266	74	2,907	1,014	1,122	269,250	11,981,924
Wisconsin.....	55,766	107,950	500	500	74	2,907	1,014	1,122	269,250	4,266
Wyoming.....										488,389
Total.....	28,508,843	31,541,831	135,281	135,281	377,774	659,509	155,853	140,713	11,063,275	49,046

¹ Prior to 1929 this material was recorded under ornamentals, etc.

² Error found in 1927 field report and totals reduced accordingly.

In addition to the foregoing, there was imported from Canada under regulation 15, quarantine 37, a total of 691,475 bulbs, plants, trees, and cuttings as compared with 318,887 during the fiscal year 1928. The total for the fiscal year 1929 includes 6,588 plants, etc., brought in by passengers through border ports where plant quarantine inspectors are stationed.

To authorize the importation of this material 542 permits were issued in 1929, as compared with 441 in 1928.

Importations of cotton, cotton wrappings, and cotton products.—Tables 32 to 35, inclusive, indicate, respectively, the

importations of cotton, cotton waste, bagging, cottonseed, seed cotton, and cottonseed products during the year. The actual number of bales of cotton, cotton waste, and bagging is indicated, but inasmuch as bales vary in size they are referred to as running bales.

In addition to the commercial importations indicated the administration supervised the entry of 901 packages of cotton samples imported by freight or express, 37 cotton-waste samples imported by freight or express, and 16,971 samples of cotton, cotton waste, and linters imported by parcel post.

TABLE 32.—*Importation of running bales of ginned cotton, by country of growth and port of entry, fiscal year 1929*¹

Country	Baltimore	Boston	Buffalo	Calexico	Detroit	El Paso	Fabens	Galveston	Island Pond	New Orleans	Newport	New York
Algeria.....		47										
Anglo-Egyptian Sudan.....		35										
British West Indies.....												1,240
Chile.....												331
China.....		682										1,337
Colombia.....												660
Dominican Republic.....												33
Dutch East Indies.....												2,146
Ecuador.....												56
Egypt.....	192,620											13,496
Haiti.....												2,120
Honduras.....		20										
India.....		9,414										52,957
Mexico.....				90,719		807	1,303					21,548
Nigeria.....		212										
Peru.....		1,580										45,224
Porto Rico.....		30										1,210
Uganda.....												
United States (continental).....	100	1,172	107		3			100	34	39	1,851	14
Total.....	100	205,812	107	90,719	3	807	1,303	100	34	39	1,851	142,372

Country	Niagara Falls	Nyando	Port Huron	Portland	Richford	Rouses Point	St. Albans	San Francisco	San Pedro	Seattle	Vanceboro	Total
Algeria.....												47
Anglo-Egyptian Sudan.....												35
British West Indies.....												1,240
Chile.....												331
China.....				176				26,200		4,891		33,286
Colombia.....												660
Dominican Republic.....												33
Dutch East Indies.....				48				731				2,925
Ecuador.....												56
Egypt.....							50					206,166
Haiti.....												2,120
Honduras.....												20
India.....				25				2,861		165		65,422
Japan.....								13				13
Mexico.....								2,304	2,395			119,076
Nigeria.....												212
Peru.....												46,804
Porto Rico.....												1,210
Uganda.....												30
United States (continental).....	363	209	1		87	62	876				376	5,394
Total.....	363	209	1	249	87	62	926	32,109	2,395	5,056	376	485,080

¹ Includes ginned cotton for immediate export and for immediate transportation and exportation.

² Includes 19,404 bales of linters.

TABLE 33.—*Importation of running bales of cotton waste, by country of origin and port of entry, fiscal year, 1929¹*

Country	Balti- more	Boston	Char- leston	De- troit	El Paso	Gal- ves- ton	Hous- ton	Island Pond	New Or- leans	New- port
Austria.....			225							
Belgium.....		345								
Canada.....	42	976		72				99		306
England.....	49	4,715	3,870			30			1,214	
France.....		2,465	75						29	
Germany.....		1,875	21			300	150		77	
Holland.....	83	2,142	70			9			1	
India.....		350								
Italy.....		12								
Japan.....		75								
Mexico.....					268					
Russia.....									7	
Switzerland.....		1,216					10			
United States (returned).....	95	15	38							
Total.....	269	14,186	4,299	72	268	339	160	99	1,328	306

Country	New York	Phila- del- phia	Port Huron	Port- land	Rich- ford	St. Al- bans	San Fran- cisco	San Pedro	Seattle	Total
Austria.....	1,240	79								1,544
Belgium.....	6,623	147								7,115
Brazil.....	113									113
Canada.....			38		163	542				2,238
China.....	52	5					564		162	783
Czechoslovakia.....	131									131
England.....	8,488	1,174		55			20			19,615
France.....	2,674	1,137								6,380
Germany.....	4,591	1,029					324			8,307
Holland.....	8,814	440					100			11,659
India.....	2,516	1,046								3,912
Ireland.....	1									1
Italy.....	2,398	182								2,592
Japan.....	1,479	855					2,913	375	3,616	9,313
Mexico.....	2,994	82								3,344
Russia.....	72	420								499
Scotland.....	61						20			81
Spain.....	3,727									3,727
Sweden.....		23								23
Switzerland.....	3,291	617					373			5,507
Turkey.....	10									10
United States (returned).....	1									149
Total.....	49,276	7,236	38	55	163	542	4,314	375	3,778	87,103

¹ Includes cotton waste for immediate export and for immediate transportation and exportation.

TABLE 34.—*Importation of running bales of bagging, by country of origin and port of entry, fiscal year 1929*

Country	Balti- more	Boston	Charles- ton	Detroit	Gal- veston	Hous- ton	New Orleans	New York
Algeria.....								1, 269
Australia.....								3
Austria.....							374	19
Belgium.....	8, 603	1, 010	463		6	30	2, 349	10, 149
Brazil.....								26
Canada.....		1		3, 514	55	50		2, 059
Cuba.....						10	2, 268	
Denmark.....	157							903
Egypt.....		85						
England.....	1, 962	3, 175	5, 237		1, 369	1, 004	1, 659	9, 099
France.....	1, 374	556	76		142	250	2, 131	13, 975
Germany.....	5, 096	460	2, 645		751	726	3, 221	1, 4320
Greece.....								219
Netherlands.....	5, 030	3, 422	809		3, 054		6, 319	11, 998
India.....								107
Ireland.....	86							197
Italy.....	178	47			1, 007	1, 398	2, 737	6, 668
Japan.....						200		
New Zealand.....								12
Nicaragua.....							10	
Portugal.....								104
Russia.....			1, 100				947	243
Scotland.....	523	202	47				96	5, 306
Spain.....	201						584	5, 832
Sweden.....								706
Switzerland.....							53	530
Wales.....								322
Total.....	23, 210	8, 958	10, 377	3, 514	6, 384	3, 668	22, 748	80, 178

Country	Nor- folk	Phila- delphia	Port Huron	Rich- ford	San Fran- cisco	Sault Ste. Marie	Savan- nah	Seattle	Total
Algeria.....		185							1, 454
Australia.....					10				13
Austria.....							56		449
Belgium.....	2, 496	406					401		25, 913
Brazil.....									26
Canada.....		22	3, 817	43		2, 539			12, 100
China.....					1, 280				1, 280
Cuba.....									2, 278
Denmark.....									1, 060
Egypt.....									85
England.....	10, 126	5, 112					3, 446		42, 189
France.....	1, 304	403					629		20, 840
Germany.....	8, 028	806					352		32, 517
Greece.....									219
Netherlands.....	7, 416	1, 985					900		40, 933
India.....									107
Ireland.....									283
Italy.....									12, 035
Japan.....					2, 582			5, 012	7, 794
New Zealand.....									12
Nicaragua.....									10
Portugal.....									104
Russia.....	222								2, 512
Scotland.....	124	594							6, 892
Spain.....	986	4							7, 607
Sweden.....									706
Switzerland.....		107							690
Wales.....									322
Total.....	30, 702	9, 624	3, 817	43	3, 872	2, 539	5, 784	5, 012	220, 430

TABLE 35.—*Importation, in tons, of cottonseed, seed cotton, and cottonseed hulls, cake, and meal, fiscal year 1929*

Port	Cotton- seed	Seed cotton	Cotton- seed hulls	Cotton- seed cake	Cotton- seed meal
Brownsville.....				1,418	
Calxico.....	1,498		4,611		
El Paso.....					597
Fabens.....				45	403
New York.....					55
Yuma.....		1,216			
Total.....	498	216	4,611	1,463	1,055

¹ Entry of cottonseed, seed cotton, and cottonseed hulls grown in the Imperial Valley, Lower California, Mexico, is allowed under permit.

Importations of brooms, broomcorn, and grain.—Tables 36 and 37 indicate, respectively, importations under quarantine 41 of brooms, broomcorn, and clean shelled corn. Importations of clean shelled corn from countries other than those listed in quarantine 24 total 236,306 bushels, practically all of which was imported from Argentina. This quantity shows a marked decrease from last year's importations of 5,117,706 $\frac{1}{4}$ bushels. No

foreign broomcorn and no seeds, other than corn, of the plants covered by quarantine 41, were imported.

In addition the administration supervised the entry under quarantine 24 of 25,446 bushels of clean shelled corn from Manchuria (7,591 bushels at San Francisco and 17,855 bushels at Seattle) and, under quarantine 55, of 5,032,903 pounds of seed or paddy rice from Mexico.

TABLE 36.—*Importation of brooms and broomcorn, by country of origin and port of entry, fiscal year 1929*

Country	Brooms					Broomcorn (bales)	
	Boston	Brownsville	Laredo	New York	Total	Detroit	Total
Italy.....	16,100			12,346	18,446		
Mexico.....		1,455	420		1,875		
Rumania.....				25,670	25,670		
United States (returned).....						13	13
Total.....	16,100	1,455	420	28,016	45,991	13	13

¹ 996 brooms transhipped to Colombia.

TABLE 37.—*Importation, in bushels, of clean shelled corn under quarantine 41, by port of entry and country of growth, fiscal year 1929*

Port	Argentina	Bahama Islands	Canada	Chile	France	Mexico	Union of South Africa	United States (re-turned)	Total
Baltimore.....	21,597								21,597
Boston.....	4,894								4,894
Detroit.....								2,659	2,659
Miami.....		3							3
New Orleans.....				2					2
New York.....	122,766				1		11		122,778
Niagara Falls.....			51						51
Nogales.....						3			3
Noyes.....			2						2
Philadelphia.....	40,926								40,926
San Francisco.....	43,391								43,391
Total.....	233,574	3	53	2	1	3	11	2,659	236,306

Importations of fruits and vegetables.—
Tables 38 and 39 indicate the fruits
and vegetables imported under per-

mit and inspection during the fiscal
year, Table 38 by countries of origin,
and Table 39 by ports of entry.

TABLE 38.—*Fruits and vegetables imported during year ended June 30, 1929, by countries of origin*

[Imported under quarantine 56 unless otherwise designated]

Kind	Country and quantity	Total
Apple.....pounds..	Norway, 20.....	20
Aralia cordata.....do..	China, 8,150.....	8,150
Arrowroot.....do..	Japan, 1,550.....	1,550
Asparagus.....do..	Italy, 30; Mexico, 19,520.....	19,550
Avocado.....do..	Chile, 3,000; Colombia (Santa Marta district), 160; Cuba, 4,611,793; Dominica, British West Indies, 300; Dominican Republic, 19,690; Jamaica, 7,460; Mexico (seeds removed), 105,152; Montserrat, British West Indies, 600; St. Lucia, British West Indies, 2,480.....	4,750,635
Banana.....bunches..	Brazil, 20; Colombia, 1,658,176; Costa Rica, 4,643,218; Cuba, 3,277,220; Ecuador, 140; Guatemala, 6,268,672; Haiti, 69; Honduras, 22,102,724; British Honduras, 183,683; Jamaica, 11,437,003; Mexico, 4,482,868; Nicaragua, 3,727,207; Panama (including Canal Zone), 4,569,119.....	62,350,119
Bean (green):		
Fava.....pounds..	Mexico, 20,354.....	20,354
Lima.....do..	Cuba, 3,272,748; Mexico, 84,503.....	3,357,251
String.....do..	Cuba, 35,593; Mexico, 2,548,679.....	2,584,272
Beet.....do..	Bermuda, 16,300; Denmark, 23,500; The Netherlands, 9,470; Mexico, 353,844.....	403,114
Berry (Rubus).....do..	Norway, 710.....	710
Broccoli.....do..	Cuba, 420.....	420
Cabbage.....do..	Cuba, 900; Denmark, 383,430; The Netherlands, 5,822,274; Mexico, 34,002.....	6,240,606
Cacao bean pod.....do..	Costa Rica, 100; Panama (including Canal Zone), 89; Trinidad, British West Indies, 150.....	339
Carrot.....do..	Belgium, 3,250; Bermuda, 254,746; Cuba, 400; Denmark, 64,250; The Netherlands, 4,685,971; Mexico, 568,809.....	5,577,426
Cassava.....do..	Cuba, 300,121; Dominican Republic, 3,113.....	303,234
Cauliflower.....do..	The Netherlands, 825; Italy, 132; Mexico, 951.....	1,908
Celery.....do..	Bermuda, 3,519,004; England, 1,080; Mexico, 1,888.....	3,521,972
Chayote.....do..	Cuba, 36,801; Dominican Republic, 1,010; Mexico, 8,937.....	46,748
Cherry (dried sour).....do..	Czechoslovakia, 5,500; Italy, 448,250; Rumania, 166,050; Union of Socialistic Soviet Republics, 24,065; Yugoslavia, 432,435.....	1,076,300
Chervil.....do..	Bermuda, 610.....	610
Cipollino.....do..	Italy, 448,016; Morocco (French), 2,200,345; Tunis, 30,110.....	2,678,471
Citrus medica.....do..	Greece, 1,389; Italy, 137; Palestine, 28,973.....	30,499
Clover top.....do..	Mexico, 1,046.....	1,046
Crescentia alata.....do..	Mexico, 150.....	150
Crosnes.....do..	Belgium, 1,230.....	1,230
Cucumber.....do..	Bahamas, 870; Cuba, 951,994; Mexico, 13,573.....	966,437
Dasheen (includes colocasia, caladium, inhame, malanga, and taro), pounds.	Azores, 413,338; China, 671,057; Cuba, 527,746; Dominican Republic, 482,829; Japan, 387,439; Mexico, 5,413; Portugal, 3,526; Venezuela, 500.....	2,491,848
Eggplant.....pounds..	Cuba, 6,265,070; Dominican Republic, 40; Mexico, 292,450; Virgin Islands, 4,910.....	6,562,470
Endive.....do..	Belgium, 2,587,822.....	2,587,822
Fennel.....do..	Bermuda, 1,620.....	1,620
Garlic.....do..	Azores, 266; Canary Islands, 600; Chile, 1,192,033; China, 100; Egypt, 50; Germany, 220,358; Hungary, 13,011; Italy, 1,079,260; Mexico, 1,006,135; Morocco (French), 176; Spain, 1,986.....	3,513,975
Ginger (crude).....do..	China, 380,345; Costa Rica, 240; Cuba, 9,164; Dominican Republic, 2,010; Japan, 563.....	392,322
Grape:		
Fresh (not hot-house), pounds.	Argentina, 4,249,646; Chile, 210,280; Mexico, 297.....	4,460,223
Hot-house.....pounds..	Belgium, 492,008; England, 10.....	492,018
Processed.....do..	Italy, 18,163.....	18,163
Grapefruit.....do..	Bahamas, 2,775; Cuba, 4,832,892; Jamaica, 225,330.....	5,060,997
Horse-radish.....do..	Denmark, 400; Germany, 1,386,741; Hungary, 1,773.....	1,388,914
Husk tomato.....do..	Mexico, 60,524.....	60,524
Jicama.....do..	Mexico, 15,575.....	15,575
Kale.....do..	Bermuda, 1,150,038.....	1,150,038
Kohl-rabi.....do..	Bermuda, 120; Mexico, 242.....	362
Kudzu.....do..	China, 136,578.....	136,578
Leek.....do..	Cuba, 1,390.....	1,390
Lemon.....crates..	Azores, 1; Cuba, 15; Honduras, 1; Italy, 331,693; Mexico, 12; Syria, 2.....	331,724
Lettuce.....pounds..	Bermuda, 2,360; Mexico, 61,818.....	64,178
Lily bulb (edible).....do..	China, 27,559.....	27,559

TABLE 38.—*Fruits and vegetables imported during year ended June 30, 1929, by countries of origin—Continued*

Kind	Country and quantity	Total
Lime (sour).....pounds..	Antigua, British West Indies, 2,350; Costa Rica, 11,200; Cuba, 425; Dominica, British West Indies, 3,295,039; Dominican Republic, 118,875; Jamaica, 421,663; Mexico, 1,006,074; St. Lucia, British West Indies, 161,900; Trinidad, British West Indies, 2,080.	5,620,206
Melon.....do.....	Argentina, 1,014,394; Chile, 3,690,762; Cuba, 1,530; Italy, 2,487; Mexico, 907,989; Spain, 1,161,779; Turkey, 1,760.	6,780,701
Mint.....do.....	Bermuda, 1,820; Mexico, 3,330.	5,150
Mustard.....do.....	Mexico, 44,863.	44,863
Nectarine.....do.....	Belgium, 134; Chile, 84,944.	85,078
Nuts (in the shell):		
Acorn.....do.....	Greece, 892,953; Italy, 305,000; Turkey, 6,389,425.	7,587,378
Chestnut.....do.....	Greece, 6,800; Netherlands, 196; Italy, 19,506,991; Portugal, 25,000; Spain, 65,133.	19,604,120
Okra.....do.....	Cuba, 1,556,823.	1,556,823
Onion.....do.....	Australia, 160,910; Azores, 36,074; Bermuda, 3,717; Chile, 8,425,041; Cuba, 1,150; Denmark, 43,069; Egypt, 5,473,296; Netherlands, 35,269,746; Hungary, 274,655; Italy, 4,195,156; Japan, 3,680; Mexico, 1,169,763; Morocco (French), 251,021; Spain, 64,343,059; Union of Socialistic Soviet Republics, 27,500; Virgin Islands, 2,800.	119,680,637
Orange:		
Under quarantine 56, pounds.	Cuba, 68,817; Dominican Republic, 6,860; Jamaica, 82,110.	157,787
Mandarin (quarantine 28), pounds.	Japan, 1,754,694.	1,754,694
Pachyrhizus.....pounds..	China, 45,455.	45,455
Parsley.....do.....	Bermuda, 635,273; Mexico, 24,583.	659,856
Parsnip.....do.....	Mexico, 100.	100
Pea.....do.....	Cuba, 307; Mexico, 20,550,557.	20,550,864
Peach.....do.....	Belgium, 888; Chile, 5,000.	5,888
Pear.....do.....	Chile, 4,000.	4,000
Pepino.....do.....	Chile, 300.	300
Pepper.....do.....	Bahamas, 4,200; Cuba, 4,479,464; Dominican Republic, 50; Mexico, 7,737,576; Virgin Islands, 580.	12,221,870
Pigeon pea.....do.....	Cuba, 730.	730
Pigweed.....do.....	Mexico, 2,011.	2,011
Pineapple.....crates..	Azores, 98; Costa Rica, 4,445; Cuba, 1,067,059; Dominican Republic, 6; Haiti, 1,714; Honduras, 4,079; Jamaica, 2; Mexico, 2,057.	1,079,460
Plantain.....bunches..	Costa Rica, 1,006; Cuba, 824,366; Dominican Republic, 2,712; Guatemala, 26; Haiti, 35; Honduras, 141,754; British Honduras, 46,058; Jamaica, 101; Mexico, 1,679; Panama (including Canal Zone), 23,023; Venezuela, 14.	1,040,774
Plum.....pounds..	Argentina, 26,080; Chile, 32,000.	58,080
Potato:		
Under quarantine 56, pounds.	Bermuda, 5,488,576.	5,488,576
Under potato regulations (order of Dec. 22, 1913), pounds.	Cuba, 4,402,507; Mexico, 426,406.	4,828,913
Pricklypear.....pounds..	Mexico, 12,380.	12,380
Pumpkin.....do.....	Cuba, 73,127; Dominican Republic, 43,606; Mexico, 11,438.	128,171
Purslane.....do.....	Mexico, 1,348.	1,348
Radish.....do.....	Bermuda, 1,530; Cuba, 320; Mexico, 90,094.	91,944
Sea onion.....do.....	Denmark, 2,425.	2,425
Spinach.....do.....	Mexico, 145,897.	145,897
Squash.....do.....	Cuba, 441,017; Mexico, 113,996.	555,013
Strawberry.....do.....	Mexico, 387.	387
Swiss chard.....do.....	Mexico, 11,238.	11,238
Tamarind bean pod.....do..	Antigua, British West Indies, 38,737; Barbados, British West Indies, 1,000; Mexico, 1,744; St. Kitts, British West Indies, 3,439.	44,920
Tangerine.....do.....	Cuba, 39,830.	39,830
Thyme.....do.....	Dominican Republic, 300; Italy, 4,400.	4,700
Tomato.....do.....	Bahamas, 7,425,165; Bermuda, 18,835; Chile, 470; Cuba, 26,356,118; Dominican Republic, 45; England, 2,340; Guernsey, Channel Islands, 12,000; Jamaica, 5,010; Mexico, 97,326,182; Virgin Islands, 13,400.	131,159,565
Turnip.....do.....	Bermuda, 4,350; Cuba, 860; Mexico, 357,765.	362,975
Vaccinium (cranberry, etc.), pounds.	Newfoundland, 2,897,485; Norway, 522; Sweden, 72.	2,898,079
Water chestnut.....pounds..	China, 1,732,142.	1,732,142
Water cress.....do.....	Mexico, 3,602.	3,602
Waterlily root.....do.....	China, 39,505; Cuba, 9,168.	48,673
Watermelon.....do.....	Mexico, 389,738; Peru, 200.	389,938

TABLE 39.—*Fruits and vegetables imported during year ended June 30, 1929, by ports of entry*

[Imported under quarantine 56 unless otherwise designated]

Kind	Port and quantity	Total
Apple.....pounds.....	New York, 20.....	20
Aralia cordata.....do.....	San Francisco, 8,150.....	8,150
Arrowroot.....do.....	Seattle, 1,550.....	1,550
Asparagus.....do.....	New York, 30; San Ysidro, 19,520.....	19,550
Avocado.....do.....	Boston, 100; Brownsville (seeds removed), 484; Eagle Pass (seeds removed), 10,741; El Paso (seeds removed), 17,796; Hidalgo (seeds removed), 6,603; Key West, 665,555; Laredo (seeds removed), 68,714; Miami, 37,993; New Orleans, 1,387,280; New York, 1,314,961; Nogales (seeds removed), 814; Tampa, 1,239,594.....	4,750,635
Banana.....bunches.....	Baltimore, 3,579,615; Boston, 3,507,436; Brownsville, 3,453; Charleston, 940,364; Eagle Pass, 1,889; El Paso, 885,033; Galveston, 872,372; Houston, 4,355; Key West, 14,089; Laredo, 198,977; Los Angeles, 1,396,629; Miami, 199,112; Mobile, 2,365,250; New Orleans, 22,198,870; New York, 18,268,317; Nogales, 72,563; Pensacola, 53,614; Philadelphia, 5,098,020; San Francisco, 1,869,659; Sault Ste. Marie, 250; Savannah, 74,256; Tampa, 745,996.....	62,350,119
Bean (green):		
Fava.....pounds.....	Nogales, 20,354.....	20,354
Lima.....do.....	El Paso, 175; New York, 3,272,748; Nogales, 65,331; San Ysidro, 18,997.....	3,357,251
String.....do.....	Brownsville, 185,451; Calexico, 11; Douglas, 3,867; Eagle Pass, 6,726; El Paso, 156,916; Hidalgo, 1,770; Laredo, 1,563,404; New York, 35,725; Nogales, 482,122; San Ysidro, 148,280.....	2,584,272
Beet.....do.....	Calexico, 270; Douglas, 11,863; Eagle Pass, 367; El Paso, 330,487; New York, 49,270; Nogales, 10,857.....	403,114
Berry (Rubus).....do.....	New York, 710.....	710
Broccoli.....do.....	New York, 420.....	420
Cabbage.....do.....	Boston, 60,000; Calexico, 135; Douglas, 13,034; Eagle Pass, 320; El Paso, 1,307; Laredo, 521; New York, 6,146,604; Nogales, 18,685.....	6,240,606
Cacao bean pod.....do.....	New Orleans, 14; New York, 325.....	339
Carrot.....do.....	Boston, 252,000; Calexico, 1,229; Douglas, 18,410; Eagle Pass, 438; El Paso, 530,744; New York, 4,756,617; Nogales, 17,988.....	5,577,426
Cassava.....do.....	Key West, 33,211; New Orleans, 1,500; New York, 227,398; Tampa, 41,125.....	303,234
Cauliflower.....do.....	Calexico, 20; Douglas, 208; New York, 957; Nogales, 723.....	1,908
Celery.....do.....	Douglas, 1,782; El Paso, 83; New York, 3,520,084; Nogales, 23.....	3,521,972
Chayote.....do.....	El Paso, 4,592; Key West, 225; Laredo, 4,345; New Orleans, 15,480; New York, 21,746; Tampa, 360.....	46,748
Cherry (dried sour).....do.....	Boston, 102,498; New York, 864,493; Philadelphia, 109,309.....	1,076,300
Chervil.....do.....	New York, 610.....	610
Cipollino.....do.....	Boston, 58,054; New York, 2,620,417.....	2,678,471
Citrus medica.....do.....	Boston, 66; Detroit, 234; New York, 30,188; Portland, 11.....	30,499
Clover top.....do.....	Douglas, 1,028; Nogales, 18.....	1,046
Crescentia alata.....do.....	El Paso, 150.....	150
Crosnes.....do.....	New York, 1,230.....	1,230
Cucumber.....do.....	Calexico, 80; Douglas, 2,454; Eagle Pass, 115; El Paso, 365; Key West, 785; Laredo, 1,286; Miami, 390; New Orleans, 18,010; New York, 933,469; Nogales, 9,273; Tampa, 210.....	966,437
Dasheen (includes colocasia, caladium, inhame, malanga, and taro), pounds.....	Boston, 19,249; Calexico, 5,413; Chicago, 2,000; Detroit, 5,000; Key West, 32,738; Los Angeles, 22,000; New York, 1,027,413; Portland, 5,726; Providence, 413,338; San Francisco, 658,187; Seattle, 228,784; Tampa, 72,000.....	2,491,848
Eggplant.....pounds.....	Douglas, 678; Eagle Pass, 24,504; El Paso, 935; Key West, 53,905; Los Angeles, 38,823; New Orleans, 943,950; New York, 5,250,550; Nogales, 227,510; Tampa, 21,615.....	6,562,470
Endive.....do.....	New York, 2,587,822.....	2,587,822
Fennel.....do.....	New York, 1,620.....	1,620
Garlic.....do.....	Boston, 153,505; Brownsville, 3,999; Calexico, 10,995; Douglas, 3,519; Eagle Pass, 3,550; El Paso, 43,332; Laredo, 573,233; New Orleans, 54,478; New York, 2,646,390; Nogales, 3,348; Philadelphia, 17,260; Providence, 266; San Francisco, 100.....	3,513,975
Ginger (crude).....do.....	Boston, 9,462; Chicago, 1,300; Detroit, 1,100; Los Angeles, 6,728; New York, 104,894; Portland, 952; San Francisco, 231,292; Seattle, 36,594.....	392,322
Grape:		
Fresh (not hothouse).....do.....	Eagle Pass, 60; El Paso, 15; Laredo, 175; New York, 4,459,926; Nogales, 47.....	4,460,223
Hothouse.....do.....	New York, 492,018.....	492,018
Processed.....do.....	New York, 18,163.....	18,163
Grapefruit.....do.....	Boston, 25,970; Chicago, 1,166,620; Cincinnati, 513,240; New York, 3,182,757; Philadelphia, 700; St. Louis, 171,710.....	5,060,997
Horse-radish.....do.....	Boston, 3,300; New York, 1,370,990; Philadelphia, 12,397; San Francisco, 2,227.....	1,388,914
Husk tomato.....do.....	Brownsville, 5,474; El Paso, 54,928; Hidalgo, 122.....	60,524
Jicama.....do.....	El Paso, 15,575.....	15,575

TABLE 39.—*Fruits and vegetables imported during year ended June 30, 1929, by ports of entry—Continued*

Kind	Port and quantity	Total
Kale.....pounds..	New York, 1,150,038.....	1, 150, 038
Kohl-rabi.....do.....	Douglas, 175; El Paso, 65; New York, 120; Nogales, 2.....	362
Kudzu.....do.....	Boston, 7,060; Detroit, 400; Los Angeles, 15,300; New York, 33,000; Portland, 508; San Francisco, 66,830; Seattle, 13,480.	136, 578
Leek.....do.....	New York, 1,390.....	1, 390
Lemon.....crates.....	Boston, 1,701; El Paso, 12; New Orleans, 43,986; New York, 286,024; Providence, 1.	331, 724
Lettuce.....pounds.....	Douglas, 14,764; Eagle Pass, 2,072; El Paso, 21,641; New York, 2,360; Nogales, 23,341.	64, 178
Lily bulb (edible).....do.....	Boston, 3,393; Chicago, 300; Detroit, 300; Los Angeles, 400; New York, 9,784; San Francisco, 8,069; Seattle, 5,313.	27, 559
Lime (sour).....do.....	Boston, 5,380; Brownsville, 7,840; Eagle Pass, 324,789; El Paso, 49,576; Laredo, 1,096,734; Los Angeles, 112,089; Mobile, 18; New Orleans, 232,644; New York, 3,713,184; Nogales, 4,002; Norfolk, 63,750; San Francisco, 10,200.	5, 620, 206
Melon.....do.....	Boston, 8,750; Brownsville, 300; Calexico, 2,850; Douglas, 320; El Paso, 445; Key West, 1,410; Laredo, 668,356; New York, 5,862,552; Nogales, 235,718.	6, 780, 701
Mint.....do.....	Douglas, 57; El Paso, 3,273; New York, 1,820.....	5, 150
Mustard.....do.....	Calexico, 5,952; Douglas, 8,456; El Paso, 25,779; Nogales, 4,676.	44, 863
Nectarine.....do.....	New York, 85,078.....	85, 078
Nuts (in the shell):		
Acorn.....do.....	New York, 7,587,378.....	7, 587, 378
Chestnut.....do.....	Boston, 814,826; New York, 18,572,859; Philadelphia, 10,546; Providence, 205,589.	19, 604, 120
Okra.....do.....	Key West, 28,495; New Orleans, 877,119; New York, 549,801; Tampa, 101,408.	1, 556, 823
Onion.....do.....	Boston, 5,445,578; Brownsville, 3,263; Calexico, 135; Douglas, 45,401; Eagle Pass, 4,097; Eastport, Me., 300; El Paso, 329,382; Hidalgo, 217; Key West, 1,150; Laredo, 768,100; New York, 112,775,555; Nogales, 19,168; Philadelphia, 83,227; Providence, 40,474; San Francisco, 55,608; Seattle, 108,982.	119, 680, 637
Orange:		
Under quarantine 56, pounds.	Boston, 22,120; Chicago, 53,480; New York, 81,487; Philadelphia, 700.	157, 787
Mandarin (quarantine 28), pounds.	Seattle, 1,754,694.....	1, 754, 694
Pachyrhizus.....pounds.....	San Francisco, 45,455.....	45, 455
Parsley.....do.....	Douglas, 1,095; El Paso, 23,149; New York, 635,273; Nogales, 839.	639, 856
Parsnip.....do.....	El Paso, 100.....	100
Pea.....do.....	Calexico, 2,744; Douglas, 324; Eagle Pass, 230; El Paso, 4,545; New York, 307; Nogales, 20,463,320; San Ysidro, 79,394.	20, 550, 864
Peach.....do.....	New York, 5,888.....	5, 888
Pear.....do.....	New York, 4,000.....	4, 000
Peplino.....do.....	New York, 300.....	300
Pepper.....do.....	Brownsville, 12,658; Calexico, 2,218; Del Rio, 10,142; Douglas, 17,894; Eagle Pass, 234,911; El Paso, 604,735; Hidalgo, 1,733; Key West, 18,975; Laredo, 181,370; Los Angeles, 100,662; New Orleans, 260,800; New York, 4,202,414; Nogales, 6,562,138; San Ysidro, 9,095; Tampa, 2,105.	12, 221, 870
Pigeon pea.....do.....	New York, 730.....	730
Pigweed.....do.....	Douglas, 579; Nogales, 1,432.....	2, 011
Pineapple.....crates.....	Boston, 5; Eagle Pass, 25; El Paso, 220; Key West, 898,072; Laredo, 75; Los Angeles, 53; Miami, 276; New Orleans, 57,005; New York, 109,804; Nogales, 75; Providence, 98; San Francisco, 80; Tampa, 13,672.	1, 079, 460
Plantain.....bunches.....	Baltimore, 600; Boston, 1,450; Key West, 70,671; Miami, 16,854; Mobile, 171; New Orleans, 71,063; New York, 190,364; Philadelphia, 501,000; San Francisco, 1,006; Tampa, 187,595.	1, 040, 774
Plum.....pounds.....	New York, 58,080.....	58, 080
Potato:		
Under quarantine 56, pounds.	New York, 5,488,576.....	5, 488, 576
Under potato regulations (order of Dec. 22, 1913), pounds.	Douglas, 272,680; Key West, 632,286; New York, 3,770,221; Nogales, 153,726.	4, 828, 913
Pricklypear.....pounds.....	Eagle Pass, 400; El Paso, 10,717; Laredo, 1,060; Nogales, 203.....	12, 380
Pumpkin.....do.....	Brownsville, 900; Calexico, 166; Douglas, 1,580; Eagle Pass, 2,896; Key West, 28,150; Laredo, 4,338; New Orleans, 220; New York, 79,288; Nogales, 1,558; Tampa, 9,075.	128, 171
Purslane.....do.....	El Paso, 230; Nogales, 1,118.....	1, 348
Radish.....do.....	Calexico, 49; Douglas, 4,468; Eagle Pass, 243; El Paso, 79,001; New York, 1,850; Nogales, 6,333.	91, 944
Sea onion.....do.....	New York, 2,425.....	2, 425

TABLE 39.—*Fruits and vegetables imported during year ended June 30, 1929, by ports of entry—Continued*

Kind	Port and quantity	Total
Spinach.....pounds..	Calexico, 695; Douglas, 16,581; El Paso, 112,671; Nogales, 15,950.	145,897
Squash.....do....	Brownsville, 75; Calexico, 1,589; Douglas, 7,860; Eagle Pass, 25; El Paso, 49,168; Key West, 3,360; Laredo, 8,734; New Orleans, 24,535; New York, 412,677; Nogales, 19,504; San Ysidro, 27,041; Tampa, 445.	555,013
Strawberry.....do....	El Paso, 387.	387
Swiss chard.....do....	El Paso, 11,238.	11,238
Tamarind bean pod.....do....	New York, 44,920.	44,920
Tangerine.....do....	Chicago, 32,830; New York, 7,000.	39,830
Thyme.....do....	New York, 4,700.	4,700
Tomato.....do....	Brownsville, 22,285; Calexico, 96; Del Rio, 4,435; Douglas, 15,546; Eagle Pass, 8,518,823; El Paso, 340,541; Hidalgo, 2,440; Key West, 5,379,452; Laredo, 816,003; Los Angeles, 6,174,005; Miami, 1,057,947; Mobile, 11,160; New Orleans, 2,878,615; New York, 24,717,390; Nogales, 78,653,154; San Francisco, 2,532,368; San Ysidro, 5,462; Tampa, 29,843.	131,159,565
Turnip.....do....	Calexico, 65; Douglas, 10,552; El Paso, 336,748; New York, 5,210; Nogales, 10,400.	362,975
Vaccinium (cranberry, etc.), pounds.	Boston, 2,153,979; New York, 744,100.	2,898,079
Water chestnut.....pounds..	Boston, 57,138; Chicago, 41,000; Detroit, 20,500; Los Angeles, 65,100; New York, 444,800; Portland, 7,500; San Francisco, 798,724; Seattle, 297,380.	1,732,142
Water cress.....do....	Douglas, 2,827; Nogales, 775.	3,602
Waterlily root.....do....	Boston, 4,020; Chicago, 2,000; New York, 9,868; Portland, 400; San Francisco, 17,945; Seattle, 14,440.	48,673
Watermelon.....do....	Calexico, 79,200; Douglas, 1,697; Eagle Pass, 200; Laredo, 150; New York, 200; Nogales, 308,491.	389,938

Plants and plant products entered for immediate exportation or for immediate transportation and exportation in bond.—In addition to the regulated imports for consumption entry recorded in the foregoing tables, the administration supervised the entry under permit, either for immediate exportation or for immediate transportation and exportation in bond, of considerable quantities of plants and plant products. Among the principal items may be mentioned approximately 1,615,000 bulbs, 97,000 convallaria pips, 634,000 fruit and rose stocks, 35,000 cacti, 16,000 orchids, 10,000 miscellaneous plants, shrubs, and trees, 13,206,000 pounds of citrus fruits, 1,386,000 pounds of potatoes, 2,666,000 pounds of garlic, 27,268,000 pounds of onions, 9,228,000 pounds of tomatoes, 133,071 pounds of cottonseed, 448,600 pounds of cottonseed cake, 2,516,600 pounds of cottonseed meal, 78,610 gallons of cottonseed oil, and 300,364 bushels of clean shelled corn. In addition to the above commodities 60,525 bales of cotton included in Table 21 and 1,510 bales of cotton waste included in Table 22 were reexported.

NEW AND REVISED PLANT QUARANTINES AND MISCELLANEOUS REGULATIONS

The following quarantines and miscellaneous regulations have been either promulgated or revised during the year.

DOMESTIC QUARANTINES

The Asiatic-beetle and Asiatic garden-beetle quarantine was promulgated March 2, 1929, restricting the interstate movement from the State of New Jersey and from the regulated areas of Connecticut, New York, Pennsylvania, and Virginia and the District of Columbia of (1) nursery, ornamental, and greenhouse stock, and all other plants, and (2) sand, soil, earth, peat, compost, and manure.

The European corn-borer quarantine was amended August 7, 1928, by adding certain towns and cities in Hudson County, N. J., to the regulated area, and inserting a requirement that corn and other restricted articles may be moved into the State of Maine from other parts of the regulated areas only under Federal certification; and February 25, 1929, by adding certain territory to the regulated areas, and discontinuing the requirement of certification of packages of shelled corn weighing 2 pounds or less.

The gipsy moth and brown-tail moth quarantine was revised September 6, 1928, by enlarging the area designated as "generally infested" in Vermont, Massachusetts, and Connecticut, and by making provision for interstate movement from the generally infested area of Christmas trees and greens originating in the lightly infested area.

The Japanese-beetle quarantine was revised January 25, 1929, by adding part of one county in the State of Maryland as well as certain new territory in Connecticut, Delaware, and Pennsylvania to the former regulated area, by the establishment of an additional regulated area consisting of the District of Columbia and part of the State of Virginia, and by making certain minor changes in the regulations.

The Mediterranean fruit-fly quarantine was promulgated April 26, 1929, restricting the interstate movement from the State of Florida of (1) fruits, vegetables, and garden and orchard products of all kinds; (2) sand, soil, earth, peat, compost, and manure; (3) railway cars, boats, and other vehicles and containers which have been used in conveying fruits or vegetables; and (4) fruit-packing equipment and all other articles including nursery stock which have been associated with the production of, or commerce in, fruits or vegetables or have been or are contaminated with sand, soil, earth, peat, compost, or manure; it was revised May 9, 1929, by providing for the holding of citrus fruit in approved cold-storage plants after June 15; for the shipment of limes from Monroe and Dade Counties subsequent to June 15; for the use of packing houses in lightly infested zones, when other facilities are absent, for the packing of fruit coming from the surrounding protective zones and adjacent points outside thereof; for the interstate movement under permit of host fruits and vegetables in dining cars, and by prohibiting bulk, mail, and automobile-truck movement of host vegetables from any part of the State; it was amended May 11, 1929, by authorizing the movement under permit of green tomatoes, chili, and Cayenne peppers from infested zones to the District of Columbia and points north and east; it was amended May 16, 1929, by prohibiting the movement of host fruits or vegetables of the crop of 1929 from any part of Florida into the States of Washington, Oregon, Idaho, California, Nevada, Utah, Arizona, New Mexico, Texas, Oklahoma, Arkansas, Louisiana, Tennessee, Mississippi, Alabama, Georgia, North Carolina, and South Carolina, and Porto Rico; it was amended May 23, 1929, by making provision for movement interstate of foreign fruits and vegetables entering the United States through Florida ports, and extending the time for the shipment of noncitrus fruits and host vegetables from protective zones in

Florida up to and including June 15, with special provision for shipping grapes up to June 30, 1929; it was amended June 4, 1929, by prohibiting the shipment of nursery stock and all other plants and plant roots by mail from any part of Florida and extending from June 1 to June 15, 1929, the citrus-fruit shipping season from protective zones established subsequent to May 31, 1929; it was revised June 7, 1929, by quarantining each and every State in the continental United States and the District of Columbia and by prohibiting reshipment from noninfested States to the Southern and Western States and territory named above, of host fruits and vegetables originating in an infested State or area; it was amended June 14, 1929, by extending the shipping period for Florida eggplants and peppers to June 30, 1929; and it was amended June 27, 1929, by releasing cowpeas from restriction.

The phony peach disease quarantine was promulgated April 30, 1929, by restricting the interstate movement from the regulated areas of Georgia and Alabama of peach trees, peach roots, nectarine trees, nectarine roots, and all kinds and varieties of trees or shrubs grafted or budded on peach or nectarine roots.

The pink-bollworm quarantine was amended November 2, 1928, by modifying the regulations with respect to the movement of cottonseed and lint, and on May 16, 1929, by releasing a part of the northern half of Dawson County, Tex., from the areas formerly designated as regulated.

The satin-moth quarantine was revised November 21, 1928, by the inclusion of additional territory in the regulated area in the States of Maine, New Hampshire, Vermont, Massachusetts, and Connecticut.

The white-pine blister-rust quarantine was revised July 31, 1928, by providing for the interstate movement under certain precautions and safeguards of 5-leaved pines from the generally infected areas, by removing the prohibition of movement from Wisconsin and Minnesota to Michigan, Pennsylvania, and New Jersey, and authorizing the interstate shipment without Federal permit and without environs inspection of cultivated red and white and mountain currant and cultivated gooseberry plants from infected States, conditioned on their having been dipped in a lime-sulphur solution of specified strength and otherwise complying with the regulations.

The Woodgate-rust quarantine was promulgated October 18, 1928, prohibiting the interstate movement from the regulated area in the State of New York of trees, branches, limbs, or twigs of all varieties of hard pines susceptible to this disease; it was amended March 9, 1929, by adding Madison County to the regulated area.

FOREIGN QUARANTINES

The nursery stock, plant, and seed quarantine was amended July 24, 1928, by prohibiting importation after June 30, 1930, of stocks of apple, pear, quince, and Mazzard cherry and by prohibiting after August 1, 1928, the importation of mango seeds; and on July 26, 1928, by authorizing the entry of the Chinese sacred lily into the territory of Hawaii under permit for forcing purposes.

MISCELLANEOUS REGULATIONS

The rules and regulations governing the movement of plants, plant products, and other quarantined articles into and out of the District of Columbia, were revised March 29, 1929, to bring up to date those parts of the regulations which involved special plant quarantines and to make such minor changes and adjustments as were necessary to define more exactly the District inspection and certification policy.

TERMINAL INSPECTION OF MAIL SHIPMENTS OF PLANTS AND PLANT PRODUCTS

During the year the State of Wyoming inaugurated terminal inspection

of mail shipments of plants and plant products under the authority of the act of March 4, 1915, and the list of plants and plant products subject to terminal inspection in Florida, and the terminal inspection points in Wyoming and Mississippi were revised.

California, Arizona, Montana, Florida, Washington, Arkansas, the District of Columbia, Mississippi, the Territory of Hawaii, Utah, Oregon, Georgia, Idaho, and Oklahoma, in the order named, had previously availed themselves of the provisions of the terminal inspection act. While this inspection is conducted entirely at the cost of the States concerned, it has been found of great value in the enforcement of our domestic-plant quarantines.

CONVICTIONS AND PENALTIES IMPOSED FOR VIOLATIONS OF THE PLANT QUARANTINE ACT

The following convictions and penalties imposed for violations of the plant quarantine act were reported to the administration during the year:

White-pine blister-rust quarantine: Six convictions, with fines aggregating \$196.

Japanese beetle quarantine: Six convictions, with fines aggregating \$256.

Mediterranean fruit-fly and melon-fly quarantine: One conviction, with fine of \$25.

Quarantines affecting Mexican products: Fines aggregating \$960 were imposed by customs officials on the Mexican border against 187 persons caught attempting to smuggle in from Mexico prohibited plants and plant products.

